

The Iron Age

A Review of the Hardware, Iron and Metal Trades.

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De Beaumont Patent Heater and Feeder and Condensing Pump.

We show herewith a patent feed-water heater and condensing pump, which is quite new, and has therefore but lately been put upon the market. Many appliances for using exhaust steam as a means of heating the boiler feed have been in use during late years, but as a means of avoiding intricate systems of pipes the present heater has some peculiar merits. In its simplest form it has but few more parts than an ordinary force pump, while it is quite effective in furnishing feed water at a temperature even as high as 100 to 200 degrees. This is accomplished by admitting a portion of the exhaust steam to the pump chamber and letting it mingle with the cold feed water which enters as spray. The combined mass then moves on to the boiler at the increased temperature. In Fig. 1 A represents the pump cylinder with its stuffing box; B is the plunger; D is the water inlet and G its check valve; C is the inlet for the exhaust steam and H its check valve; E is the exit for the water and condensed steam to the boiler, and F is the boiler check; I is a cock to blow out any sediment that may collect in the bottom of the pump barrel. There is no increase of back pressure produced by the operation of this pump, as the exhaust is perfectly free, merely being tapped to furnish the required supply for heating purposes. This has been estimated to take about one-sixth of the entire exhaust, and in engines working expansively, like the Corliss, where less steam and therefore less water is used for a given amount of work, one-eighth has been found sufficient. The condensation in the pump chamber is rapid and complete, the water passing into said chamber through a thimble split at right angles, which causes it to enter in the form of the spray before mentioned. The volume of water and steam is easily regulated to suit the necessities, and a very hot feed is thus obtained in the simplest manner by the addition of a single piece of pipe and a check valve. The arrangement was originally designed for locomotive pumps, where the immense quantities of steam required in a short time make a hot feed a matter of importance, but it is of course equally applicable to stationary boilers. It is said that, when used on locomotives, the quantity of exhaust taken for this purpose does not affect the draught, as many engineers suppose. This heater and feeder is in use at the Collins Printing House, 705 Jayne street, Philadelphia, where it can be seen in successful operation; and at D. B. Fuller & Co.'s bakery, No. 16 S. Eighteenth street, Philadelphia. This pump may be driven direct or by a belt. When driven direct and used as a complete condenser, it has the form shown in Fig. 2. B is the steam cylinder and C the steam pipe; A is the cylinder of the condensing pump, five-twelfths the area of the steam cylinder; F is the water inlet; E the connection with the exhaust, and D the outlet for the condensed steam. The pump piston head is on the same rod as the steam piston, and as the exhaust from the steam cylinder passes through proper check valves to the opposite inlet of the water cylinder and is immediately condensed, there is a more or less perfect vacuum on opposite sides of the pistons and a gain in power equal to the difference in area between the two, multiplied by the pressure due to that vacuum. This pump will supply more hot water than is necessary to feed the boiler, some of which may therefore be used for other purposes. The condenser may be worked independently of the engine if required, like many other pumps. The action of this condenser is claimed to be so effective that a much smaller amount of water is required for the purpose than usual, and the engine is thus relieved of much of the duty expended in working the pumps. Further particulars can be obtained from De Beaumont Patent Condensing Pump Company, No. 721 Chestnut street, Philadelphia.

The Martini-Henry Rifle.

The rifle which is known as the Martini-Henry and which is used by all the Turkish soldiers, is a breech-loader, and was originally invented by a Boston gunsmith. I say invented, for although the rifle at present does not bear his name, the basic idea of it—the breech mechanism—mostly originated with him and not with Martini, as is generally supposed. This Boston gunsmith is named Henry O. Peabody. He had been connected for years with the Spencer Rifle Company, and in 1862 brought to the notice of the Providence Tool Company a breech-loading rifle he had invented. It was then in quite a crude form, but after careful study was advanced to such perfection that the tool company obtained control of the patent, and in 1865 took it to Europe in order to introduce it to the notice of the various governments. While the rifle was being canvassed in Europe a Hungarian gunmaker living in Switzerland, named M. Martini, saw the valuable and novel American invention, and set to work to improve it. The Peabody rifle had a side lock. Martini did away with

this, inventing a spiral spring inclosed in the block of the breech, and making some modifications of Peabody's ideas. The Martini rifle remained in abeyance for some time, the inventor showing it however to several European governments, but receiving no contracts for it. The Peabody rifle was manufactured by the Providence Tool Company to the number of 150,000, and sales were made in Europe and the United States. France purchased some 40,000, for use in the Franco-Prussian war; the army of Roumania took 25,000; Switzerland became a purchaser of 15,000, and small lots were disposed of in Cuba, Canada and other countries. In all cases the Peabody rifles gave great satisfaction.

In 1868 the English government arranged and carried out a most exhaustive test of all kinds of breech-loading rifles. The English Arms Commission decided finally that the system of rifling of the barrel, invented by Mr. Henry, the celebrated Scotch gunmaker of Edinburgh, and the Martini breech mechanism, combined in one rifle, was the most desirable. This combination rifle, which was denominated the Martini-Henry, was afterward adopted into the English army, and the British troops are now armed with it. The claims of Peabody as the original inventor of the basic principle of the Martini breech mechanism were discarded by the English government, and the honors given to the Hungarian, who was so fortunate as to suggest and apply certain improvements and modifications. Even the famed Henry rifling, it has been found, was originally invented and applied by a gunsmith in Northern New York State long before it appeared on the so-called Henry rifle. There

was not satisfied with the Snider rifle, the Ottoman government concluded to adopt the Martini-Henry rifle, and in 1873 made a contract with the Providence Tool Company for 60,000 of these rifles, after precisely the same model as those adopted by the English government. The tool company held the Peabody patent, and also obtained the right to use the Martini improvement, and after a year or so of preparation for the extensive job began to turn out the rifles in 1874. The rifles called for in the Turkish contract are those denominated the Martini-Henry, and they are so called by the tool company in their dealing with Turkey, but they are called, when made for other parties, the Peabody-Martini rifles, as, although the Henry rifle is used, the name is discarded on the ground that the honor of the invention does not belong to Mr. Henry. The Peabody breech mechanism being the foundation for the Martini improvements, the tool company believe that Peabody's name should be associated with the rifle.

As already stated, when the Servian war began last fall the Turks engaged in that contest were only armed at first with the Snider rifle. Great shipments of the Martini-Henry rifle had been made by the tool company to Turkey, but they were in the government storehouses and had not been given into the hands of the soldiers. After a time a few thousand of the new rifles were sent to the Turkish army in Servia for trial. Almost immediately reports came back to the army headquarters from the generals in the field expressing great satisfaction with the Martini-Henry rifles, and requests were made that the Snider rifles should be withdrawn and the entire army in Servia supplied with

were quite interesting, and the scientific results were closely noted by the gentlemen present. A piece of common wrought iron, one inch long and with one-half a square inch area at the ends, was stood on end, and was found to resist 39,970 pounds pressure before it yielded, after which the fiber was destroyed, and it was crushed to about half its original length and spread to nearly double thickness, its consistency at the close of the test having become entirely granular. A piece of white pine wood, 2 inches square and 4 inches long, stood on end, commenced to crush at 10,250 pounds pressure, the grain of the wood telescoping at about the center and the block losing about an inch in length. A piece of close grained white ash wood of the same dimensions commenced to crush at 20,830 pounds, a wedge-shaped section being forced out laterally from the center of the block.

The next experiment was in crushing a round bar of cast iron, of the same size as the piece of wrought iron mentioned, viz., one-half a square inch area at the ends and 1 inch long. This was stood on end and yielded to 16,000 pounds pressure, breaking diagonally in the center, and showing a complete disintegration at the point of fracture, so much so that the particles of iron could be scraped from the surface of the fracture with the finger nail.

A piece of wire cord, about half an inch thick, with a cotton core, broke at 800 pounds tensile strain, after stretching over 50 per cent. A bar of cast iron, turned down to half of a square inch section, was next submitted to tensile strain, when it broke at 18,020 pounds, showing a tensile strength of 36,030

tions and fines, requisitions, lodging and boarding troops, thefts, fires and all other war consequences have been assumed by the government and amount to a grand total of \$177,000,000. The total amount of indemnities audited and granted up to the first of May last was \$123,430,000, and it is shown by figures and facts, that the aggregate pecuniary losses of the French nation inflicted by the war is not less than the enormous sum of \$1,200,000,000. Nearly the whole of this has been allowed and much of it already paid. Now, contrast this astounding financial depletion with the no less astounding exhibit of the Bank of France on the 24th of March, 1877, at which time there were in its vaults gold and silver reserves to the amount of \$445,688,244, and we are enabled to form a correct idea of the immense recuperative financial power of France.

Refractory Materials.—Prof. T. Eggleston, in a discourse on this subject, generalizes as follows: "These materials are usually clays, which are silicates of alumina and a few natural rocks. Rocks can rarely be used, as they are never homogeneous, and are liable to crack; clays cannot be used as they are found, but must be mixed with other substances. They are refractory, in proportion to the alumina they contain, and less useful, as they are acid; two or three per cent. of iron is sufficient to make a brick fusible at high temperature. Silica alone is exceedingly infusible, but has no binding power. The Dinas brick, which is silica, is formed by one and a half per cent. of lime, and will resist a clear, white heat alone, but is worthless if it comes in contact with metallic oxides; two per cent.

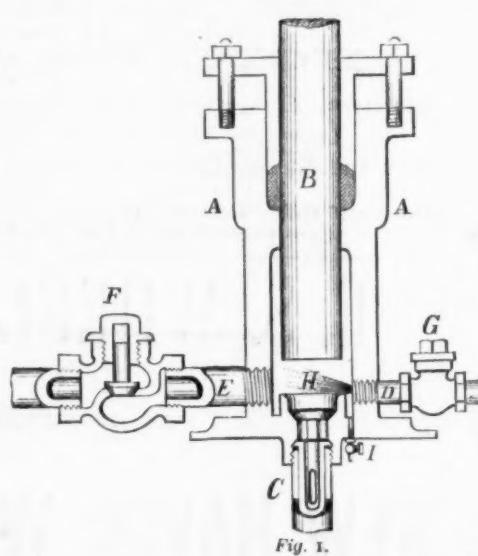
of oxide of iron would make such a brick useless in a Siemens-Martin furnace. A silica brick expands to such an extent that the rods of a furnace have to be loosened while it is being heated, and tightened when the furnace cools. Alumina is also very infusible, but it contracts at a high heat, and has therefore to be mixed with silica or burned clay to prevent this contraction, as any depressions or contractions would make eddies in the flame and rapidly destroy the furnace. Bauxite, a hydrated compound of alumina and iron, which sometimes contains a little silica and sometimes none at all, is also used. Siemens makes a brick of this substance which contains three to five per cent. of silica only, which is five times as infusible as the best Stourbridge brick. We have the anomaly of six per cent. of oxide of iron making one material as fusible as ordinary brick, and another containing over 20 per cent. of the same material being infusible. Lime and magnesia are also very refractory; they are both used to make crucibles for the fusion of platinum, but lime can only be had as a carbonate, which, under heat, becomes caustic, and when the heat is allowed to go

down it slacks and falls to powder, so that it can only be used, as in Styria, in very small continuous furnaces. As lime is very friable, the campaigns are never long. Magnesia is also a very refractory material, but difficult to get. Besides the effect which the chemical composition has upon the refractoriness of materials, there is an effect due to molecular condition which has been but little studied and is still less understood."

Germany is about to try the experiment of exporting coal on a large scale, and an association has been formed with this object, called the "Westphalian Coal Export Association." Coal owners representing an output of 3,750,000 tons have, it is stated, already been enrolled, and an additional number of members is expected, sufficient to bring the total output represented to 6,000,000 tons. Several arrangements with many of the railway companies for the transit of coal to the North Sea ports have, says the Manchester *Guardian*, now for some time past been in operation, and in the ports both of the North Sea and the Baltic manifold relations have been opened with chambers of commerce, mercantile firms and wharf-owners, with a view to promoting the consumption and export of German coal in the joint interest of those concerned. Several cargoes have already been dispatched to St. Petersburg, Riga, Spain and other places, and additional contracts have been secured.

Germany, according to a Westphalian journal, *Gluckauf*, can in a very short time increase her output 50 per cent., and is in a position to establish successfully a coasting and export trade in coal.—*Pall Mall Gazette*.

It is estimated that the coast at the mouth of the Suez Canal, at Port Said, is advancing outward at the rapid rate of about 50 yards per annum, and that the necessity for extensive dredging will be greater year by year. Not less than 937,000 cubic yards of deposit had to be removed in 1875, while the dredging of 161,000 cubic yards sufficed in 1871. The British Government has ordered a new survey of the coast between Port Said and the Damiette mouth of the Nile, in order to ascertain the actual condition and the rate of increase of the sandbanks, and to see if any plan besides dredging can be adopted to check the growth of the obstruction.



DE BEAUMONT'S HEATER AND FEEDER AND CONDENSING PUMP.

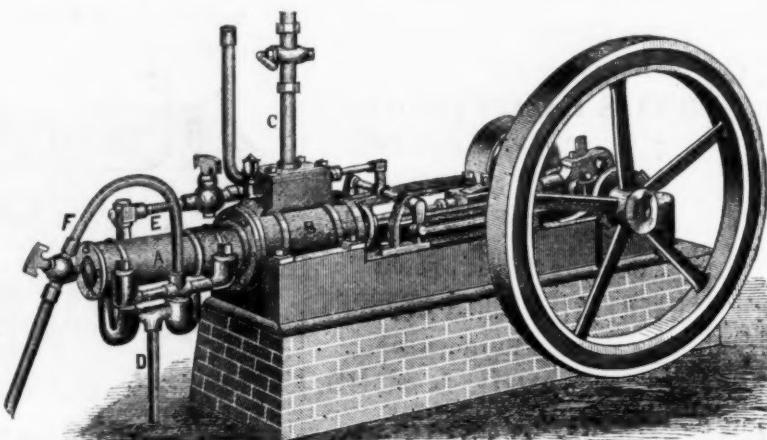


Fig. 2.

is conclusive proof that Mr. Henry obtained the idea of the system of rifling, which he claims as his own, from one of the rifles made by this New Yorker, and taken to England by a party of hunters who had been enjoying a season of gaming in the northern wilds of New York. Nevertheless, the fact remains that the Martini-Henry rifle received the endorsement of the English government, and had its position established securely.

The Martini-Henry rifle is strong and substantial and bears rough usage. This is a great desideratum for an army in active service. The parts composing the breech mechanism combine the greatest possible strength with simplicity of construction, and the result of long and careful study to produce a rifle meeting all the requirements of military service. No movement of the barrel or any other part except those immediately connected with the breech is required in the performance of any of its operations. In loading, the whole movement of the block is made within the breech frame or receiver, the end of the block lever falling but a short distance from the stock. The block itself is a strong piece, and when in position for firing is so firmly secured as to insure its perfect safety. The block when drawn down for loading slopes toward the breech of the barrel, and the cartridge slides easily into the chamber, without the necessity even of looking to see if it is properly inserted. The manipulations for loading and firing are of the simplest kind. The rifles are sighted at 1300 yards, and may be made effective at 1800 yards. They are made with great care and subjected to a thorough inspection by United States inspectors from the Springfield Armory, and afterward they are re-inspected by Turkish inspectors sent here by the Ottoman government. If the Turks discover the least defect or blemish in a rifle it is thrown out. This rigid scrutiny insures perfect work.

The Turkish army at the beginning of the Servian war were mostly armed with the Snider breech-loading rifle. The Ottoman government had purchased Springfield muzzle-loading rifles from the United States after our war, and had them altered to the Snider breech. This rifle had many defects. Its range was short and its breech mechanism was difficult to manipulate. For rough military service it was found inadequate

to the Martini-Henry. This was done at once, greatly to the delight and improvement of the Turkish troops then in the field. From that time all the army were furnished with the Martini-Henry rifles, and it is believed that all the arms made by the tool company are now in use by the Turks engaged in defending their country from the Russians.

The present Turco-Russian war is the first extensive contest in which the Martini-Henry rifles have been used. They have been tried in one or two petty wars, but the test they are getting now is the first worthy of the name. Information from the seat of war is to the effect that they are meeting this severe test admirably. They are found accurate and precise, and no accidents are reported from their use. It is stated that the morale of the soldiers of the Turkish army has been much improved by the use of these rifles. They handle them with perfect ease and confidence, and their ability to do effective work with them at long range promotes remarkable enthusiasm.

Riehle Brothers' Testing Machine.

In a recent issue of *The Iron Age* we presented to our readers an improved testing machine by Riehle Brothers, of Philadelphia. A few days ago a number of gentlemen were invited to witness experiments made upon a machine of that description, with still greater improvements. The machine has an upright iron frame, at the base of which is a hydraulic jack, from which the power is obtained by means of a small hand pump. The specimens to be tested are placed between grips, which communicate with a scale beam by which the amount of power in pounds is accurately shown during the entire test. The testing machine which was the special object of the visit is a duplicate of one built for the Ohio Agricultural and Mechanical College, Columbus, Ohio, for use in the technological education of the students. Its capacity is 40,000 lbs., and this amount of strain may be applied either as tension, crushing power or transverse bearing strain, the machine being so fitted that it may be applied to any of these modes. The changes can be made with the greatest facility from one kind of strain to another, overcoming the difficulty in this respect most satisfactorily. Some of the experiments

pounds to the inch. A bar of common wrought iron of the same size yielded to 19,000 pounds strain and commenced to stretch. At 2600 pounds strain it had lengthened .33 of an inch in 3 inches. At 27,300 pounds strain the iron lost its "life," and afterward broke, having lengthened .99 of an inch and reduced in diameter at the point of breakage nearly one-third. Tests for lateral strain were next made. A common wrought iron bar, 1 inch square and 1 foot long between bearings, giving way at 4500 pounds pressure, and a bar of pine wood, 2 inches square and the same length, breaking at 2080 pounds pressure.

The Messrs. Riehle have also made for the University of Ohio, at Columbus, a small testing machine of 100 pounds capacity, which is worked on the same principle, except that the power is obtained by a wheel and screw instead of from a hydraulic jack.

The machine tried yesterday was not by any means one of the most powerful made by the firm, its capacity being only 40,000 pounds, while they have constructed several of 75 tons, or 168,000 pounds capacity, some of which were made for the United States government.

We think a machine of this kind would be a valuable acquisition to any college, so that practical illustrations could be given of the strength of the various materials, and their behavior while under strain.

English data has hitherto, we believe, been taken as correct, which experience has shown does not apply to the strength of our products, and has probably been the cause of many of the recent disasters.

Everybody is astonished at the recuperative financial power of France, but only comparatively few know the extent of that power. Germany demanded and obtained one thousand millions of dollars, but the French government lately published some very interesting and remarkable statistics, showing the actual amount of pecuniary damage done by the Franco-German war, which let in a flood of light on the subject. It appears that thirty-four departments, or three-eighths of France, were occupied by German troops, who, obeying the orders of their government, enforced the Napoleonic principle of "making war support war." The damage sustained by individuals and departments, whether by reason of contribu-

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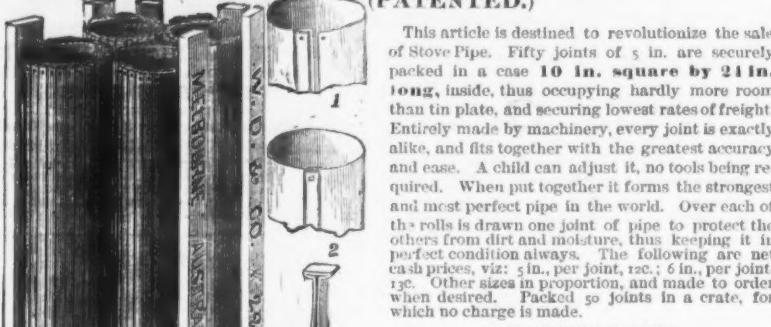


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MANUFACTURERS OF ALL KINDS OF

HAMMERED AND ROLLED

STEEL,

Warranted Equal to any Produced.

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For Edge and Turning Tools, Taps, Dies, Drills, Punches, Shear-Knives, Cold-Chisels and Machinists' Tools generally.

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"Solid Soft Center" Cast Plow Steel.

Finished Rolling Plow Coulters with Patent Screw Hubs attached.

Agricultural Steel cut to any pattern desired.

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MICA TO ORDER IN ANY PATTERN.

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No. 129, Fore Plane 30 inches in length, 2½ inch Cutter. \$2.25.

The Labor Market in New South Wales.

In view of the fact that the English press is just now seeking to encourage in every possible way the emigration of skilled labor to the colonies, the following letter from an emigrant in New South Wales to the editor of the *Sheffield Independent* will be found interesting:

"As to the voyage hither, not one of our party of 350 emigrants was the worse, and many of them were the better for the trip. It is when the emigrant steps ashore that his troubles begin. He is under the same conditions as to obtaining employment as at home. If there is any difference, it is in favor of home. There is no running down to the ship to engage men, and no crowding of employers of labor at the emigrants' depot. Of the whole lot I only know of one man who got employment through government agency (of course excepting the young women). Of the mechanics, there are some who have been more months in the colony than they have done days' work. I will give a few instances of how we fared. I know a plumber who is on the tramp, picking up a day's work here and there by the way; a clerk, who is now a milkman at Bondi; a Thurgoland furnace man, who, with some puddlers from Shropshire, are striking for a smith; a roller from Saville street is a bush policeman, as is also a cutter, and an M. S. and L. locomotive driver is carrying charcoal dust up a plank.

"My own experience is: I got a job in an iron bar mill at 36 per week. I found the heat so oppressive and the labor so heavy that I gave up the billet at the week's end. I spent a week running after advertised jobs, and then took a billet which I should have scorned to take at home, and after a few weeks threw it up."

"Again, I was at the *Herald* office to secure an early copy, and applied for a job of a strong young man wanted in a store. I was there with six others by 6.30 a.m., and at 8.30 a.m. not less than six times six were crowded about the entrance. We were told to apply at 2 p.m., at which hour not less than 50 men were waiting. A clerk took down the name of each one, and read his reference, and although he began at 2 p.m., my turn had not come at 2.45 p.m., and there was still a mob unseen. I was engaged by next morning's post to my surprise, at 35 per week, of which I pay 20 for board and lodging.

"Sydney swarms with unemployed men, as do all the cities on the coast of Australasia. The authorities say, 'These men are out of work because they won't work.' However, I happen to know men, mechanics—one with best references from the Peninsular and Oriental Company, and others of unquestionable character, who cannot obtain any employment, though they have earnestly and daily applied for it.

"If a man has £100 he may take up land in the bush and live in a log hut and have plenty of work doubtless. But even then the climate is so sickle that 50 per cent. of the crop is sure to be destroyed, either by drought or flood. There is also irregular employment to be got on the stations in the bush, at from 10 to 20 per week and board, but not a single comfort of civilization, and all the miseries of a semi-savage life. On the other side, I know of a carpenter, watchmaker, coach painter, compositor, plasterer, and brickmaker who have each done better here than at home. I do not wish to prejudice any of my townspeople against coming out here, but shall be very thankful if I am the means of placing them in a position to know what to expect should they come. There are many well-to-do people here who have risen from the ranks, and people of experience say that in the long run this country is best, but many may be found who hold the contrary to be true."

Locks of the Olden Time.

One of the great centers of the lock-making trade in England is Wolverhampton. This town has been famous for its locks time out of mind, and 200 years ago the town had skilled workmen, cunning to make fine locks.

One Dr. Plot, writing in 1686, says of Wolverhampton: "The greatest excellency of the blacksmith's profession in this county lies in their making of locks for doors, wherein the artisans of Wolverhampton seem to be preferred to all others, they making them in suites, six, eight or more in a suite, according as the Chapman bespeaks them, whereof the keys shall neither of them open the other's lock, yet one master-key shall open them all. Nay, so curious are they in locking that they can contrive a lock that the master or mistress of a family sending a servant into their closets, either with a master-key or their own, can certainly tell by the lock how many times that servant has been in, at any distance of time, or how many times the lock has been shot for a whole year together, some of them being made to shew it 300, 500, or 1000 times; nay, one of the chief workmen of the town told me he could make one that should shew it 10,000 times. Further yet, I was told of a very fine lock, made in this town, sold for £20, that had a set of chimes in it, that could go at any hour the master should think fit. And these locks they make either with brass or iron boxes, so curiously polish'd and the keys so finely wrought that 'tis not reasonable to think they were ever exceeded unless by Tubal Cain, the inspired artificer in brass and iron." Dr. Wilkes, writing a century later, pays an equally flattering tribute to the skill of Wolverhampton artisans, and mentions that the number of locksmiths at Wolverhampton at that time was 134.

Wolverhampton has for generations also been celebrated for its locks and keys, and its artisans have acquired a considerable reputation for their ingenuity. In the year 1776, one James Lees, a workman in his sixty-fourth year, made a lock and key the weight of which did not exceed that of a silver two-pence, and he expressed his readiness to make a dozen locks and keys the total weight of which should not exceed a silver sixpence. At that time the number of locksmiths in Wolverhampton was 148. At the present time, however, the locks chiefly manufactured at Wolverhampton are similar in kind, but of inferior quality, to those produced in Wolverhampton, with the exception of the

fine plato, which are not made there. Willenhall locks are much inferior to Wolverhampton make. They are all warded, the wards varying of course in strength and quality, known as common, fine, round, sash and solid wards. One peculiarity of the lock trade at Willenhall is its distribution among so many masters, the majority of whom employ only some six or eight men and boys. This system has introduced a spirit of rivalry and competition, of which purchasers of locks have not been slow to take advantage, and the consequence has been to reduce the price in some branches to so low a point that excellence of workmanship has given way to rapidity of production, and this has doubtless given rise to the familiar saying that if a Willenhall locksmith happens to let fall a lock in the process of manufacture he does not stay to pick it up, as he can make another in less time. The late Mr. G. B. Thorneycroft, who resided at Willenhall for a time, was once taunted that some padlocks were made in Willenhall that would only lock once; but when he was told the price—namely, two-pence—he replied, "Well, it would be a shame if they did lock twice for that money." It is said the same articles are now sold at one halfpenny each!

A Terrible Warning.

Some time ago two young mechanics in a Maryland town entered into a co-partnership as wheelwrights and carriage builders. Both gentlemen were possessed of shrewdness and industry, and were getting along in a very happy and contented way until they determined to venture upon a rash undertaking. Up to that time they had been able to take things easy. They had been coming to their shop in the morning just when they felt like it, and quitting in the evening just when they pleased. There was no hurry, no rush, no worry. Things went on in a smooth, sober, and comfortable manner. But, as was intimated above, they one day decided upon a change of tactics. They concluded to insert a conspicuous advertisement in the local daily. More than this, they actually had their names and business printed upon several hundred circulars, and caused the same to be extensively distributed. Then, with a recklessness that was truly astonishing, they managed to get themselves frequently mentioned in the local columns of the newspapers. They might have known that everybody would read those notices, but with a singular fatality they continued the same desperate management until at length they got themselves into a most awkward fix. The first intimation they had of coming trouble was when they realized that additional help must be employed. They employed additional help, but still their vexations were not over. Only last week they discovered that their shop was entirely too small. Then they bought lumber, employed workmen, and will have just about finished to-day another shop in the rear, somewhat larger than their original one. Strange infatuation! Both these clever young men might have been enjoying a comfortable nap this very afternoon if it had not been for their own unguarded conduct. But there is no further rest for them except on Sundays, and a few short hours after ten every day. We cannot say where it will all end. Deluded creatures! We warn them in time! If they don't mind they will be compelled to employ still other assistants, and make still other additions to their shop. But advice seems to be thrown away on such venturesome people. At all events, they should consider the example they are setting. They should remember that other mechanics and business men may go and do likewise. Then what a calamity will they have to contemplate! A town that was once quiet and sedate, rendered bustling and noisy with the hum of business, the buzz of factories, and the rush of accelerated commerce. We turn from the picture with fear and trembling.

Galvanizing Iron.—Molesworth gives the following directions for galvanizing iron—coating iron with zinc. The directions are very explicit and will be found valuable by many of our readers

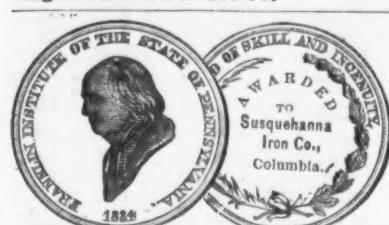
Iron.	Iron.	Iron.	Iron.	Iron.
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PIERSON & CO., Established 1790, 24 & 26 Broadway, 77 & 79 New St. NEW YORK CITY,	A. B. Warner & Son, IRON MERCHANTS, 28 & 29 West and 52 Washington Sts. BOILER PLATE, Boiler Tubes, Angle, Tee & Girder Iron, Boller and Tank Rivets. Sole Agents for the celebrated "Eureka," Pennocks, "Wawasset," Lukens, Brands of Iron. Also all descriptions of Plate, Sheet, and Gageometer Iron. Special attention to Locomotive Iron. Fire Box Iron a specialty.	U. O. CRANE. Broker in PIG IRON & METALS, 104 John St. New York.	WOOD & LEMAN, IRON and STEEL RAILS, OLD RAILS, Pig, Bar & Scrap Iron, Cars & Locomotives, W. E. COFFIN & CO.'S Franconia & Pembroke Bar. Iron, And Patent Straightened Shafting. 33 WALL ST., NEW YORK.	A. G. HATRY, Manufacturers' Agent and Broker Bar, Sheet, Tank, Boiler, Angle, T, and Railroad Iron, Nails & Spikes, Steel & R. R. Supplies, PITTSBURGH, PA.
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A. R. Whitney & Bro., Manufacturers of and Dealers in IRON, 56, 58 & 60 Hudson, 48, 50 & 52 Thomas, and } NEW YORK. 12, 14 & 16 Worth Sts.,	Dan'l W. Richards & Co., Importers of and Dealers in SCRAP IRON, Pig Iron, OLD METALS. 88 to 104 Mangin Street, Foot of Stanton St., E. R., NEW YORK.	OXFORD IRON CO., Cut Nails and Spikes, R. R. Spikes, Splice Bars and Nuts and Bolts, 81, 83 & 85 Washington, near Rector St., N. Y. JAMES S. SCRANTON, Agent.	TAYLOR IRON. Unexcelled for Strength, Soundness and Uniformity, and Capable of Receiving the Highest Finish. Orders executed from store with immediate despatch.	Armor Plates
Our specialty is in Manufacturing Iron Used in the Construction of Fire-Proof Buildings, Bridges, &c. Plans and estimates furnished, and contracts made for erecting Iron Structures of every description, each containing cuts of all Iron made sent on application by mail. Sample pieces at office. Please address 58 Hudson Street.	JAMES WILLIAMSON & CO., SCOTCH AND AMERICAN PIG IRON, No. 69 Wall St., New York.	Burden Iron Works, H. Burden & Sons	RANDALL & JONES, Sole Representatives in the United States and Canada, No. 10 Oliver St., Boston.	FROM One to Fifteen Inches Thick UP TO Ten and a Half Feet Wide and Fifteen to Twenty Feet Long.
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Rounds, Squares and Flat Bars, Bands, Skins, Hoop and Horse Shoe Iron, Ovals, Half Ovals, Half Rounds, Scrolls and Nut Iron. An assortment of sizes constantly in stock. Also Plow, Cultivator, Hoe and Shovel Steel. Send for Price List.

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See the firm's name and tempered by "ELLIS' PROCESS" to suit any kind of work. Special attention given to the manufacture of Nellis' Original Harpoon Horse Hay Fork Grapple and Wood Wheel Wrought Frame Horse Fork Pulleys. Medals awarded on all goods of our manufacture exhibited at the Centennial.

Roofs for Iron Structures.

(Concluded.)

ZINC.

The tenacity or strength of zinc is much below that of iron, and a closer framework is necessary in the parts of immediate support (the lath or roll), while, on the other hand, as a covering material impervious to rust, it is more to be relied on than the galvanized iron, which has only a coating of zinc. Although sometimes corrugated like the galvanized iron, zinc is more often laid in straight sheets, with corrugations only at the points of connection with the framework. For flat roofs, or for steep or "mansard" roofs, zinc is often used in situations where, formerly, lead was the only available material.

It is of great importance that zinc should be perfectly pure, for if it contain iron, as is frequently the case, it will not resist the action of the air. The best zinc used in this country is practically pure, as on analysis only the faintest traces of iron are found in it.

Zinc, though subject to oxidize, has this peculiarity, that the oxide does not scale off like that of iron, but forms a permanent coating on the metal impervious to the action of the atmosphere, and rendering the use of paint wholly unnecessary. The expansion and contraction of zinc are much greater than those of iron; hence in use proper attention must be paid to the circumstance, and plenty of play allowed in the laps, or a substantial and durable covering will not be obtained.

The thickness of zinc sheets is designated by a special gauge, whose divisions approximate to those of the B. W. G., but with the numbers differently arranged, as will be seen by the following table, where both sets of numbers are given. The weights per square foot are for perfectly plain sheeting, without corrugation or bonds of any kind:

Zinc gauge.	Approx. weight per sq. ft.
2	13 16 oz.
3	14 19 "
4	15 22 "
5	16 25 "

Nos. 14 and 15 are the best for good work. No. 13 should only be used where it is necessary to exercise the greatest possible saving in first cost.

Zinc is generally rolled in sheets 3 ft. wide by 7 or 8 ft. long, and up to 10 ft. where specially ordered. The exact effective length and width, when applied to roofs, is given in the following description of the various modes of fixing.

The different modes of laying zinc roof covering are known by the following names, and the weights affixed are approximate and per square, including the corrugations and laps:

No. of gauge..... Lbs. Lbs. Lbs. Lbs.

1. Ordinary corrugation... 130 155 175 195

2. Plain roll cap.... 130 150 170 190

3. Drawn roll cap.... 138 153 175 195

4. Italian corrugation... 130 155 175 195

1. Ordinary Corrugation for zinc is now seldom used, except for side inclosures or for curved roofs, it having been mostly superseded by other methods. The effective width of the 3 ft. sheet, when corrugated, is 2 ft. 6 in.

The purlines are generally of light timber or iron.

2. Plain Roll Cap (French Plan).—This is laid on wood boarding with wood rolls, the ends of the sheets being turned up against the rolls in the width of the sheets and with a cap the whole width of the sheet. The clips are about 1 1/2 in. long, placed at intervals. In the length of the sheet the joints are made with folding laps.

By this plan, which is very similar to that in which lead is laid, the sheets are left perfectly free for contraction or expansion. The effective width of the rolls is 2 ft. 10 1/2 in.

3. Drawn Roll Cap.—This is laid similarly to the plain roll cap, but the wood rolls have the zinc drawn over them by machinery (Fig. 9), thus dispensing with the loose zinc roll cap. This method is preferred to Method

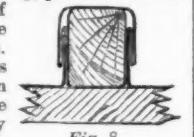


Fig. 8.

2 for strength, durability and the facility with which it can be laid, as the zinc sheets can be turned up just before they are put on the roof, and the drawn cap has then only to be dropped over the joints and screwed down. The effective width of the sheets according to this plan is 2 feet 11 inches.

4. Italian Corrugation.—This method (Fig. 10) is under most circumstances the best, and



Fig. 9.

has the advantage that the sheets can be laid without boarding, and if the zinc be prepared in the usual way it can be laid by unskilled workmen. The sheets lap over each other on the rolls, and are screwed down as shown in Fig. 11. The effective width of the sheets is 2 feet 6 inches. The rolls are generally laid upon purlines placed about every 7 feet, but if necessary the distance may be increased by the use of stronger rolls.

The usual depth for the rolls is 3 inches, but if laid upon boarding they need only be 2 inches deep. Zinc, on the Italian system, is very effective in relieving the monotonous appearance of a large surface.

The cost of zinc roofing depends on the current price of spelter, and on the shape and size of the roof.

Zinc being very ductile can be readily bent into shape, and can be cut and adjusted to

* The Vieille Montagne Company, in Belgium, who are the principal makers of zinc sheets in Europe, and from whom roof makers obtain their supplies, altered, in the year 1875, the numbers of the zinc gauge, reducing the thickness by one figure, No. 14 being the same as No. 13 was before 1875, No. 13 as No. 12, and so on.

the exact sizes. There are often special situations where considerable extra labor and cutting to waste are involved. But for plain roofing the following may be taken as approximate prices per square of the different systems just described, when spelter is at £22 per ton, including fastenings but no boarding or rolls: No. 13 gauge, £2. 10/-; No. 14, £2. 15/-; No. 15, £3; No. 16, £3. 5/- Fixing the sheets costs from 10/- to 15/- per square. Packing for shipment about £1. 10/- per ton. The extra cost of wood rolls, as used for the Italian corrugation, is from 9/- to 11/- per square.

Clear transparent glass is always specified by its weight per foot, and the cost increases with the size of the panes. Moderate sized sheets of 21 oz. glass (an ordinary thickness) cost from 6d. to 8d. per square foot, according to quality.

Glazing costs rd. to 2d. per square foot, according to the height from the ground and other circumstances. Wood sash bars cost from rd. to 3d. per linear foot, according to the section.

Sash bars, in shape nearly resembling those in wood, are rolled in wrought iron from 1 in. to 3 in. deep. They weigh from ½ lb. to 5 lbs. per foot, and cost from 13/- to 16/- per cwt. Although in iron roofs such sash bars are frequently used, it is difficult with them to keep the roof watertight, owing to the expansion and contraction of the iron and glass not being in the same ratio. For this reason wood sash bars are often employed for iron roofs, but in any case the risk of breakage may be lessened by using putty made in such a way as not to become brittle. Bars of iron from 1 in. to 1½ inch deep may be used as sash bars. For bars of deep and strong section, cast instead of wrought iron is often used, as more convenient for the connections and as more durable against rust. So also complete sash frames are made of cast iron.

Glass may be bent to any curve to suit a circular or domed roof; but it is often, especially in foreign countries, difficult to replace glass of this sort when broken. Stained or colored glass is often employed in conservatories.

In roofs covered with slates or tiles, where it is difficult or undesirable to insert skylights, or to use sash bars, glass, shaped as tiles and slates may be adopted, these being made so that they will work in with ordinary tiles and slates.

Practical Dealing With the Labor Question

—In conversation with a prominent gentleman of this city, Mr. Chaffee, the trustee and manager of the A. & W. Sprague estate, made a statement full of suggestions to those interested in the labor problem. This estate now employs about ten thousand hands, and Mr. Chaffee says that, although these hands are now receiving less wages than at any period since the establishment of the Sprague Works, nearly a half century since, he has never seen them so contented. He ascribes the cheerful condition of his working people under low wages amid general labor disturbances mainly to the fact that the estate furnishes each head of a family enough ground for a good-sized garden, or from one-quarter to one-half acre of tillable ground. The scant wages have forced them to carefully cultivate these little plots, and the people find they can almost raise subsistence for their families. So, instead of want, they have fair support and even many luxuries, and from the lowest wages are able to lay by. Besides, the care of cultivating these gardens, and keeping a pig or cow, or both, not only holds the men from the dissipation incident to idle hours, but furnishes healthful recreation and inculcates a home sentiment and sense of security and proprietorship that eminently improves the *morale* of the laborer. This arrangement affords a safety valve and protection to both employer and employee. Wages can be reduced without instantly threatening starvation. The laborer is withheld from hasty severance of his connection with employer by regard for located home interests. But when there is a surplus of miners or artisans, and some must be idle or seek other pursuit than the accustomed trade, then this miniature farming has opened the way to work that will always support. It is giving skilled laborers in one branch a reserve trade which they can always fall back upon in emergency, and removes that pitiable helplessness that attacks the strongest mechanic when thrust from his regular trade.

Fishing for Russian Torpedoes

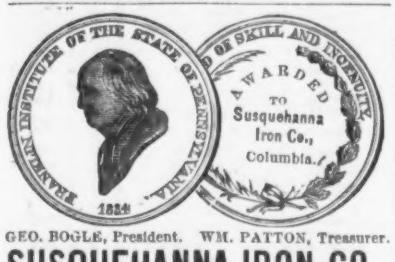
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(Concluded.)

ZINC.

The tenacity or strength of zinc is much below that of iron, and a closer framework is necessary in the parts of immediate support (the lath or roll), while, on the other hand, as a covering material impervious to rust, it is more to be relied on than the galvanized iron, which has only a coating of zinc. Although sometimes corrugated like the galvanized iron, zinc is more often laid in straight sheets, with corrugations only at the points of connection with the framework. For flat roofs, or for steep or "mansard" roofs, zinc is often used in situations where, formerly, lead was the only available material.

It is of great importance that zinc should be perfectly pure, for if it contain iron, as is frequently the case, it will not resist the action of the air. The best zinc used in this country is practically pure, as on analysis only the faintest traces of iron are found in it.

Zinc, though subject to oxidize, has this peculiarity, that the oxide does not scale off like that of iron, but forms a permanent coating on the metal impervious to the action of the atmosphere, and rendering the use of paint wholly unnecessary. The expansion and contraction of zinc are much greater than those of iron; hence in use proper attention must be paid to the circumstance, and plenty of play allowed in the laps, or a substantial and durable covering will not be obtained.

The thickness of zinc sheets is designated by a special gauge, whose divisions approximate to those of the B. W. G., but with the numbers differently arranged, as will be seen by the following table, where both sets of numbers are given. The weights per square foot are for perfectly plain sheeting, without corrugation or bends of any kind:

	Zinc gauge.	Approx. weight per sq. ft.
2	13	16 oz.
3	14	19 "
4	15	22 "
5	16	25 "

Nos. 14 and 15 are the best for good work. No. 13 should only be used where it is necessary to exercise the greatest possible saving in first cost.

Zinc is generally rolled in sheets 3 ft. wide by 7 or 8 ft. long, and up to 10 ft. where specially ordered. The exact effective length and width, when applied to roofs, is given in the following description of the various modes of fixing.

The different modes of laying zinc roof covering are known by the following names, and the weights affixed are approximate and per square, including the corrugations and laps:

No. of gauge.....	13	14	15	16
1. Ordinary corrugation.....	130	155	175	195
2. Plain roll cap.....	130	150	170	190
3. Drawn roll cap.....	135	155	175	195
Italian corrugation.....	130	155	175	195

1. *Ordinary Corrugation* for zinc is now seldom used, except for side inclosures or for curved roofs, it having been mostly superseded by other methods. The effective width of the 3 ft. sheet, when corrugated, is 2 ft. 6 in. The purlines are generally of light timber or iron.

2. *Plain Roll Cap (French Plan)*.—This is laid on wood boarding with wood rolls, the ends of the sheets being turned up against the rolls in the width of the sheets and with a cap the whole width of the sheet. The clips are about 1 1/2 in. long, placed at intervals. In the length of the sheet the joints are made with folding laps.

By this plan, which is very similar to that in which lead is laid, the sheets are left perfectly free for contraction or expansion. The effective width of the sheets, i. e., from center to center of the rolls, is 2 ft. 10 1/2 in.

3. *Drawn Roll Cap*.—This is laid similarly to the plain roll cap, but the wood rolls have the zinc drawn over them by machinery (Fig. 9), thus dispensing with the loose zinc roll cap. This method is preferred to Method 2 for strength, durability and the facility with which it can be laid, as the zinc sheets can be turned up just before they are put on the roof, and the drawn cap has then

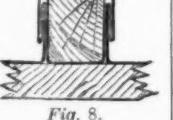


Fig. 8.

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Fishing for Russian Torpedoes.—A letter from Erzeroum in the Hamburg Correspondent gives some particulars of the new corps of divers which has been organized by the Turkish government for the purpose of removing the torpedoes laid down by the Russians in the Danube and on the shores of the Black Sea. These divers, says the correspondent, are Mohammedans from Lazistan, and a certain number of them are attached to each of the Turkish squadrons cruising in the Black Sea. When the ships arrive near a spot where the existence of torpedoes is suspected, two of the divers row to the place in a very light boat drawing so little water that there is scarcely any danger of its striking against the torpedoes. On arriving at their destination one of the rowers dives into the sea; if he finds a wire or rope by which the torpedo is attached he cuts it with a sharp instrument and returns quickly into the boat. The liberated torpedo floats to the surface of the water, the men pass a sort of lasso round it, take it in tow, and then row back to the ship as quickly as possible. For each torpedo thus captured the divers are paid \$45, and also a sum of money equal to one-half of its value. Although the men have been often employed on this dangerous service, not a single accident has yet occurred to any of them.

The *Celestial Empire*, published in Shanghai, China, offers some suggestions that might be of value on this side of the globe, as the temperature which calls forth the remarks is not higher than that of most American cities in midsummer. The Chinese practice of roofing their streets in hot weather with a temporary covering of matting is spoken of in terms of high approval. Streets thus shaded are said to furnish a most agreeable shade. It

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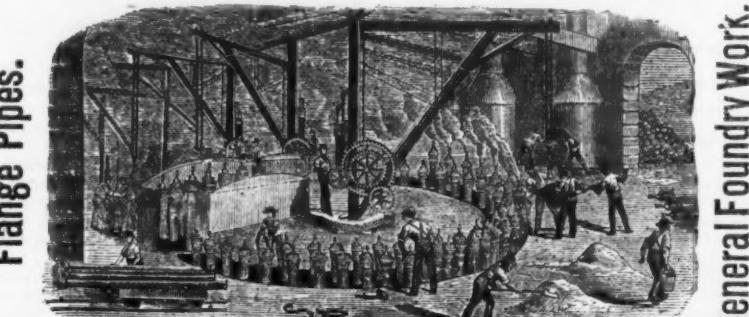
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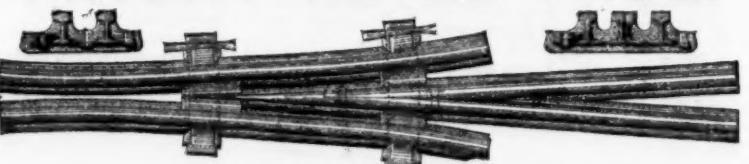
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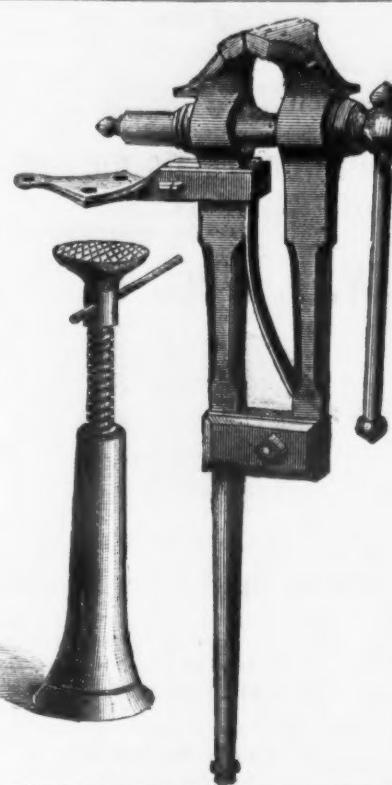
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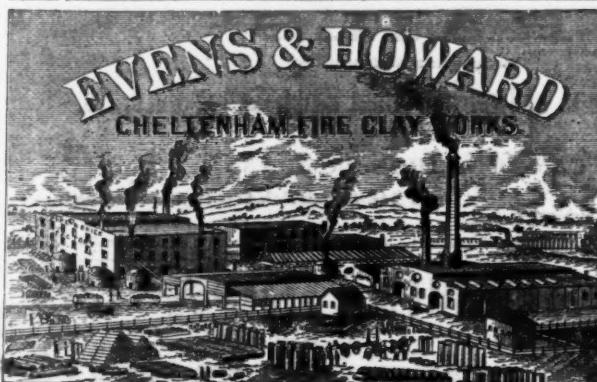
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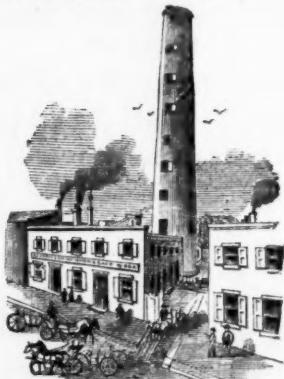
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The Fall Trade.

The Philadelphia *North American* says: There is really a fair prospect of a good fall trade, and the pioneer indications have already been felt in the dry goods line, which always leads the van. With the reopening of railway travel there has come an influx of mercantile visitors from the interior, as well as unusually large receipts of produce. The deadness of the summer is fast giving way to a brisk movement. But there are frequent and desperate efforts to prolong the stagnation by reports of fresh railroad strikes, and by the propagation of absurd rumors of all kinds of trouble, apparently set in circulation by some central authority engaged in working the wires far and near in some speculative scheme at the expense of the general prosperity. Undeniably the success of these aims is aided by the sensitiveness of the public mind and the absence of any commanding progressive movement. So long as the attention of the people remains so wide awake to every appearance of possible or probable disaster, active business enterprise will labor under manifest impediments.

The receipts of breadstuffs and provisions since the restoration of railroad traffic have been large and steady, and have given a new impetus to shipments to Europe and the West Indies and South America. Live stock is also arriving very freely from the interior, and the petroleum movement looks lively again. Coal was not interrupted at all in the Schuylkill region in its shipments, and the Reading receipts continue very large, while prices are advancing at all the leading marts of the trade. As the renewed agitation for a free-trade tariff must again unsettle foreign imports and induce importers to hold off and await developments before ordering fresh cargoes, as well as to sell off as fast as possible the stocks in hand to avoid possible loss consequent upon a low tariff, the field for domestic goods is better than it was. Indeed, the same feeling of uncertainty just alluded to in reference to the import trade ought, and undoubtedly does, operate to force sales of domestic goods to avoid chances of loss on accumulated stocks of manufactured products in warehouse and in store.

Notwithstanding the attention attracted by the return to Europe of a few mechanics to seek employment, there are evidences of a reopening of the European immigration movement to avoid the sweeping military systems of the old world. Some 5000 poor immigrants have arrived at New York, and there is a manifest increase also at Philadelphia. The through ticket arrangement from Europe to the Western frontier, however, doesn't appear to be as actively at work as could be desired, and the consequence of the influx is an overflow of the crowded labor markets of the seaboard. In any Western region where there is a large demand for agricultural laborers the trunk-line railroads could furnish an unlimited supply. If the recent outbreaks do not accomplish good in any other way, they may perhaps induce a general and organized movement to establish systematic emigration to the Western frontiers under the auspices of the trunk-line railroads and the foreign steamship lines.

Southern trade receives more attention since the restoration of peace and harmony in that section turned the people from political agitation to agriculture, manufactures, mining and commerce, and a belief is gaining ground that a large part of the surplus products of industry at the North could be profitably worked off in the Southern markets, and that considerable sacrifices would be justifiable to secure permanent possession of the trade. The general unprofitableness of Southern railways is caused largely by the absence of the class of merchandise which at the North constitutes the best reliance of the companies for revenues; and this absence has been due to the hue and cry raised at the North against the Southern trade, which has scared away the mass of the Northern merchants from venturing into such a field. An impression is gaining force that this trade might be made far more profitable than that of a large part of the foreign countries now engaging so much of our exports. Political misrepresentations and sectional prejudices have been allowed too much sway in restraining manufacturers and merchants from seeking to cultivate this traffic.

The efforts of wreckers and croakers to extend and perpetuate the general want of confidence among capitalists and investors have affected all values so much as to have caused an indiscriminate reaction. In fact the thing was so obviously overdone in the effort to produce a universal panic that investors have felt the necessity of throwing aside their excessive caution if they would not eat up their principal instead of earning any interest on their capital. It has, however, so long been customary to complain of the universal dullness that even when any line of business is moderately active it is slurred over in the verbal reports. Aggregate trade reports give totals that are singularly at variance with these sweeping complaints, and lead us to wonder that the enormous transactions thus indicated are never spoken of in the daily reports. When things are really dull, the report usually is that there is nothing doing. When they are excitingly active, the report says "fair business." There is always some wonderful time expected that never comes, when everybody is to make money and no one to lose.

Tinned Hollow Ware.

The early history of the manufacture of tinned hollow-ware is of no little interest. The manufacture of hollow-ware in England seems to have been begun almost as soon as the art of iron founding was known. The manufacture of tinned hollow-ware, however, is of more modern origin, dating back about a century.

The entire process by which tinned hollow-ware is manufactured was patented by one Jonathan Taylor (said to have been a workman at the Eagle Foundry, Birmingham, England), in November, 1779. Taylor's claim, extracted from the specification of his patent, is for "An invention for casting oval-bellied cast iron pots, and 'nealing, turning, tinning and finishing the same, and also nealing, turning, tinning, and finishing such kinds of round cast iron pots and saucers as are made with a head or rim round

the top." Taylor's patent was bought and worked by Messrs. Izon & Whitehurst, who were engaged in the manufacture of cast ironmongery at a small foundry in Duke street, Birmingham. Whether this firm had attempted the manufacture of black (unfinished) hollow-ware, or of the improved tinned hollow-ware, before their purchase of Taylor's patent, is not certainly known; that they made articles of cast ironmongery—now distinguished by the trade name of odd-work—at that time, is inferred from the fact that the firm always combined the manufacture of these articles with that of tinned and black hollow-ware since the introduction of the latter, and were also patentees of an invention for making cast hinges, with the secret joint, in 1775. This invention for casting hinges was for joining the two halves or flaps of the hinge in the casting, instead of casting them separately and fitting them together afterward. The wire running through the two halves of the joint is surrounded by the cast metal and is entirely hidden; hence the name of secret hinges.

The advantages the improved tinned kitchen furniture, as it was called, possessed were that it could be made in any shape required, was light and convenient in use, was elegant in appearance—at least compared with the three-leg pot which it superseded to a great extent—and was much cheaper than brass or copper cooking vessels. As consequence it met with ready sale, and Messrs. Izon & Co. found it necessary to quit their confined premises in Duke street and remove their business to West Bromwich, where, in addition to a convenient site for the works, they had the use of water power. This removal took place at Michaelmas, in the year 1780. The traditions of the firm describe the humble beginning of what has since become a manufacture of some importance. It is related that at Duke street the blast for the cupola in melting the iron was got from a bellowe worked by two men, and that the machinery was turned by horse power. Also that when Mr. Izon removed to West Bromwich he brought only seven or eight workmen with him, and that even this small band was looked upon with such distrust by the inhabitants of that then rural district as to be refused lodgings, so that Mr. Izon had to buy or build cottages for his workmen. Numerous anecdotes are current in the trade, all of which point to the fact of this manufacture having been begun and conducted on the most primitive scale by those who were the first to engage in it. It is stated on trustworthy authority that iron for making hollow-ware was melted in a pot furnace by a competitor of Messrs. Izon & Co., about the year 1800.

The first improvement to be mentioned is one in the annealing, a process necessary to soften the cast iron before it can be turned bright in a lathe, preparatory to tinning. The method first practiced was very rude and ineffectual. The ware was packed in strong iron pots or pans, was piled up in the open air on a stage constructed of strong iron gratings placed side by side and end to end to any required extent. The whole was then covered over with coke, and the interstices, as well within the pans as without, were filled up with coal dust, to prevent as much as possible the access of air to the heated ware. The coke was then fired, and the pile kept at a red heat for about 24 hours. The absence of means for retaining and regulating the heat employed—in short, of conducting the operation safely and economically—is evident. Mr. Archibald Kenrick, who began to make articles of cast ironmongery at West Bromwich in 1791, and hollow-ware in 1805, was the first to remedy these defects by building an annealing oven. The annealing oven, as it was first constructed and afterward improved at Mr. Kenrick's works, is an arched chamber, lined with bricks of Stourbridge fire-clay, 22 feet long, 11 feet 6 inches wide and 7 feet 6 inches high; it has a fire-place in the middle, 5 feet wide, extending the whole length of the oven; it has flues in the walls and roof opening into the oven and communicating with a stack high enough to cause a strong draught, which is moderated as required by means of dampers. Thick iron pans to hold the ware, 3 feet 8 inches high and 2 feet 4 inches in diameter, are placed on each side of the fire-place, the flame and hot air from which envelope them completely in passing to the flues. Formerly, when the ware was sufficiently softened, the fire was allowed to burn out and the oven gradually to cool. There were two drawbacks to the perfect success of this method, viz., the time occupied and the waste of heat consequent on lowering the temperature of the oven to a point at which a workman could enter it and empty the pans. Both these defects were removed by the simple contrivance of placing the pans containing the ware on carriages, and running these in and out of the oven on an iron tramway. This last improvement, it is only justice to state, was the invention of an ingenious bricklayer, named Moses Calloway. It dates from about 1817; the brick oven from 1807.

Mr. Kenrick improved the appearance of tinned hollow-ware by attention to the finish, and by substituting a stove-dried varnish for the black lead which had before been used as an outside coating. He also was the first to make saucers with a rim or head round the top, an improvement claimed in Taylor's specification, but which had never been carried out—probably on account of additional difficulty in casting.

In 1815 Mr. Kenrick patented certain improvements in cast iron coffee mills, which gave him a great name, and eventually enabled him to obtain the largest trade in this article.

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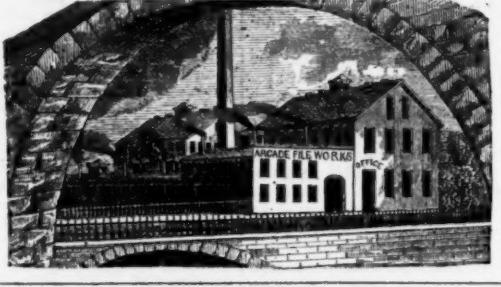
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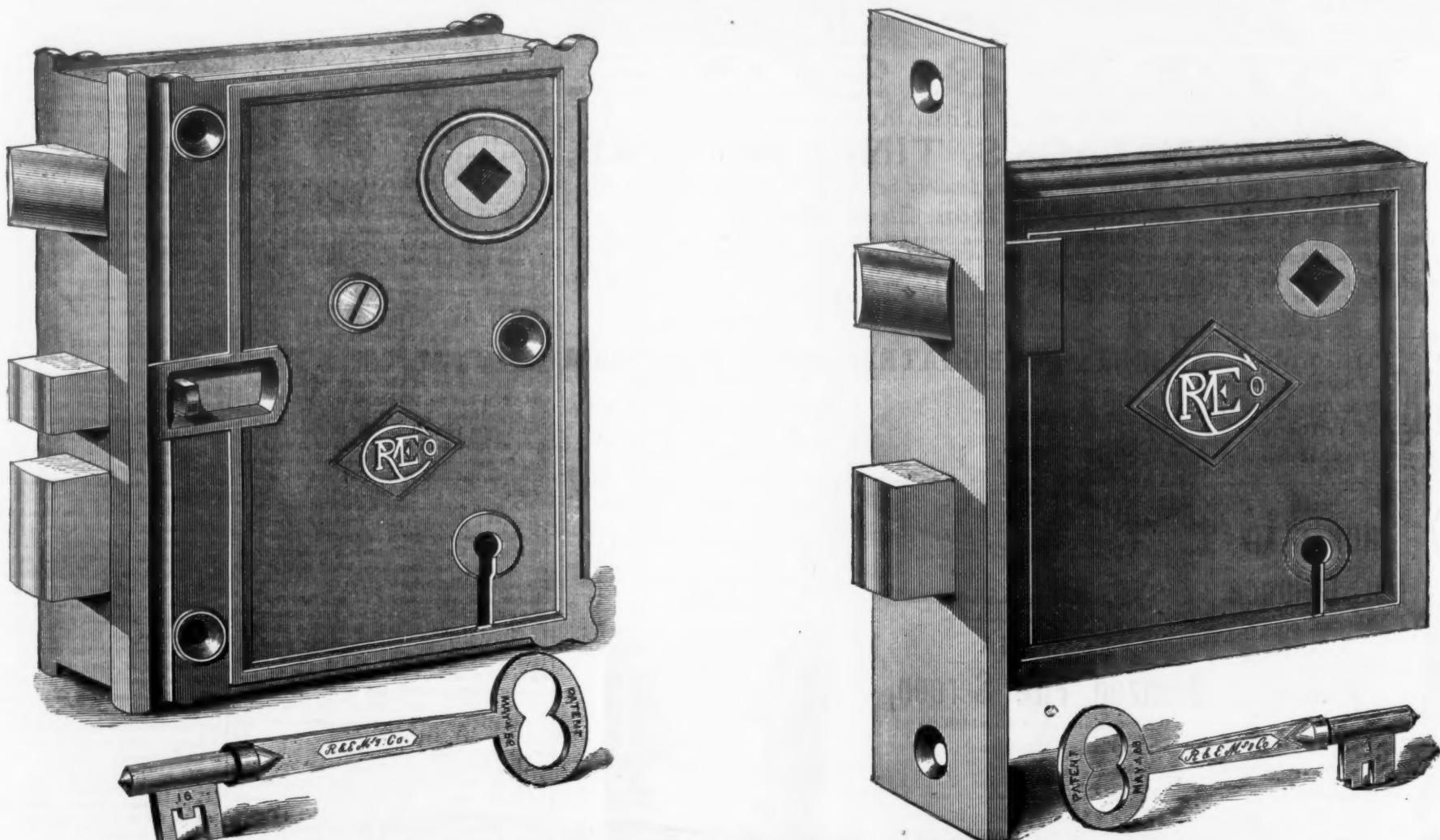
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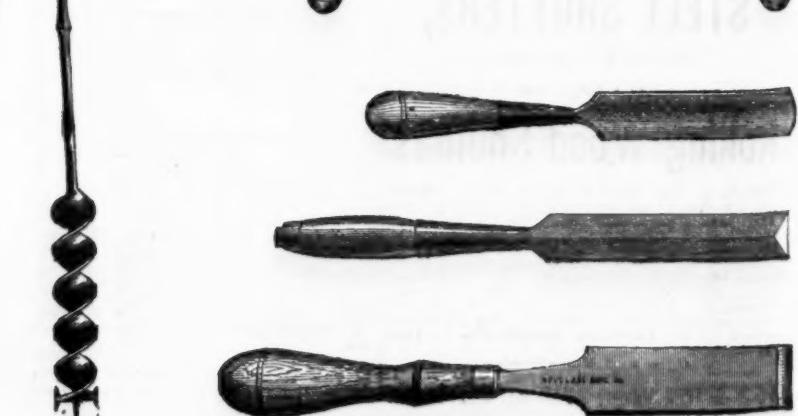
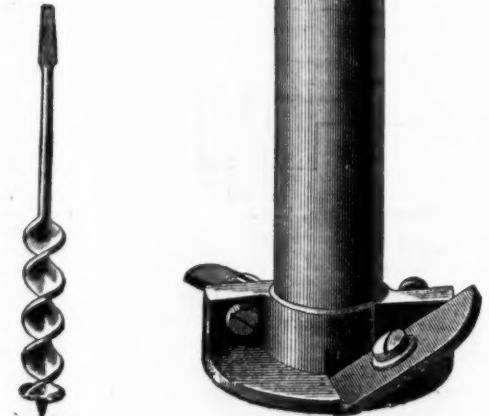
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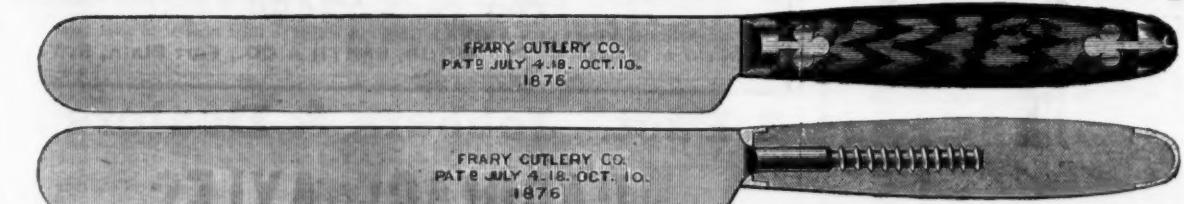
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There is no question but that a solid handle knife is much more preferable than a scale tang. The great objection to their use hitherto is, that no solid wood handle has been placed on the market with the handle properly secured—no handle put on with cement will stand the wear and tear of every day usage. The cement will expand and contract with the action of heat and cold, and become loose, crack and come off, causing great prejudice against their use. This objection is overcome in our patent screw tang. A wood screw is welded to the tang of the knife or fork, and screwed firmly and securely in the handle and locked there by the bolster, making a very strong and handsome knife, which we warrant never to get loose, crack or come off. We manufacture a large variety of patterns, both Table, Butchers and Carvers, and furnish the patent handle nearly as low as the scale tang. We are prepared to furnish this line of goods, together with the scale tang and iron handle, very promptly, and very respectfully invite the attention of the trade.

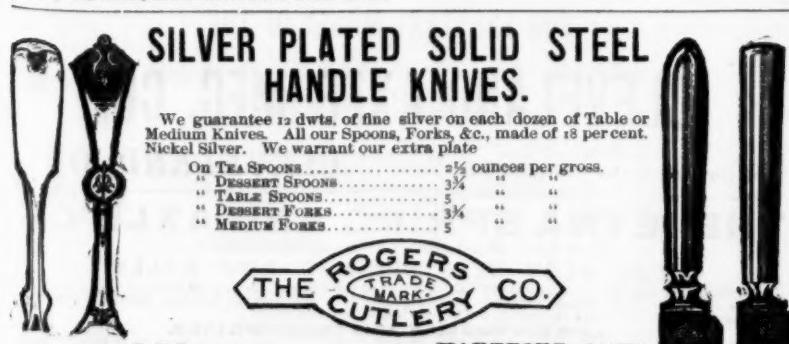
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We guarantee 12 dwts. of fine silver on each dozen of Table or Medium Knives. All our Spoons, Forks, &c., made of 18 per cent. Nickel Silver. We warrant our extra plate.

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Pat. May 24, 1870.

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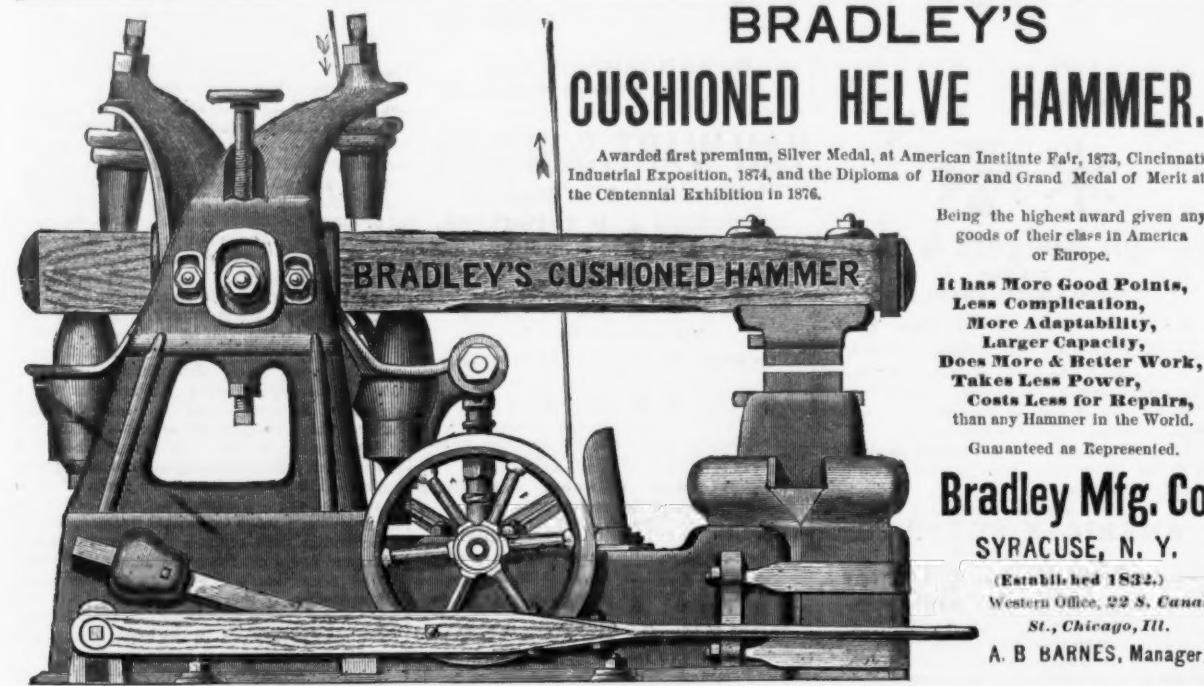
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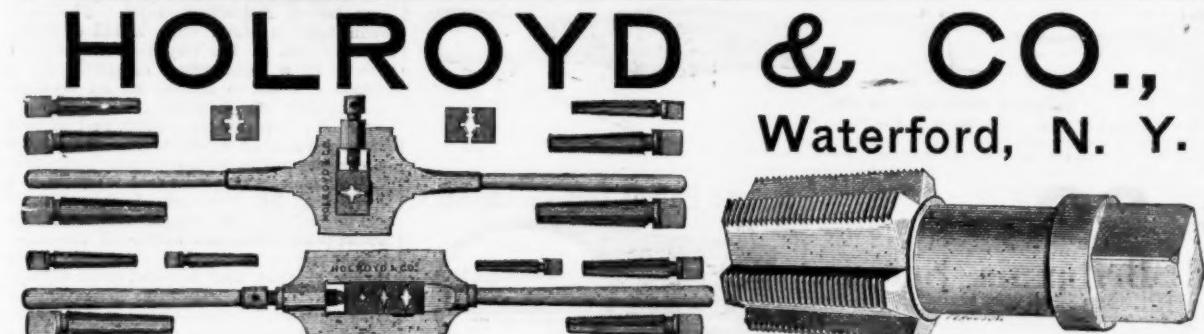
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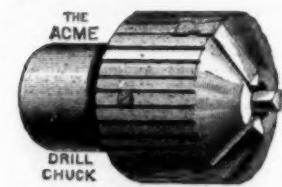
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This stop is stronger than any in the market, and is a perfect stop.

All kinds of Machine Patterns made to order. Special attention paid to Mechanics' Tools and Patent Office Models. Send for circulars.

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Orders from the trade solicited. Send for catalogue.

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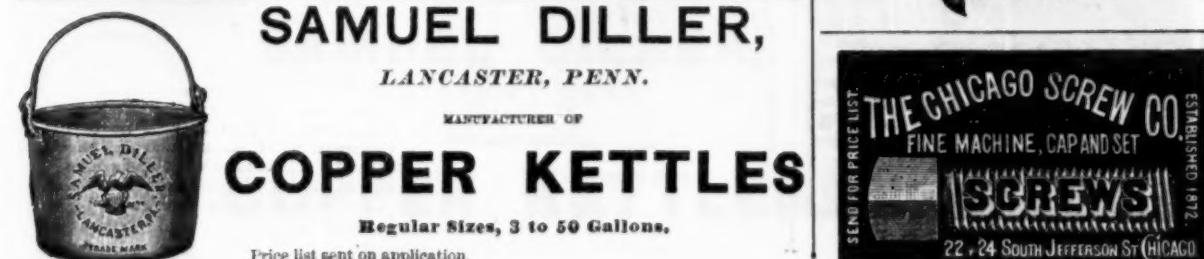
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LEWIS'S TORSION AND CROSS SPRINGS.

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advice in regard to repairs and management from experts. It often happens that the water of a particular locality favors the formation of scale or mud deposits, or, it may be, corrodes the iron. These points the inspector can decide and give the owner hints which could not usually be obtained otherwise, except at considerable expense. We might go on and give the reader an outline of what we may term the duties of steam users to the steam boiler, but this can better be obtained from books upon the subject. We merely wish to urge upon the steam users the necessity of good judgment in the care of steam boilers, and to enforce the idea that the boiler is of quite as much consequence in its way as the engine. We may illustrate the latter point by a little history. A manufacturer long since built several engines of a particular pattern and fitted them up complete with boilers ready for service. They were all sold and gave good satisfaction, and everyone supposed that they were very economical steam users. They certainly developed large power on a small consumption of coal. One of the engines was sent back to the shop, after a year or more of usage, to make an alteration. It was discovered that through a series of mistakes all the engines of that pattern had been set out with the valves so constructed and set that the steam followed practically through the whole stroke, and yet the large and very efficient boilers had very much more than made up for this fault, and the engines were doing their work in every case with somewhat greater economy than their competitors. It is needless to say that the valves of that engine were at once reset and the others attended to as soon as they could be reached. As might have been expected, there was a great gain, but the lesson taught was one that should not be forgotten. The boiler was large in proportion to the engine, and made an abundance of dry steam with a small expenditure of power, and proved itself the better half of the combination. Here we may suggest that those who purchase boilers should be sure they are large enough. The ratio of three to five is not a bad one for the engine and boiler—that is, five horse-power of boiler for every three horse-power of engine. This makes the boiler cost somewhat more, but the additional expense will probably not, in any ordinary form of boiler, be more than 15 per cent. The saving in fuel, the better and more regular supply of steam and the reduced wear and tear pay for this increase of cost many times over.

It is not to be wondered at that at the present time manufacturers who sell engines and boilers combined are paying more attention to the boiler and leaving the refinements of the engine to others. The consequence is that the cost in coal of small steam powers has probably been reduced two-thirds within ten years, even where the same engine is employed.

The Lake Superior Ore Trade.

The Lake Superior ore trade for this year presents some features that are worthy of note. The most notable is the large increase in the output of the mines. The shipments from the several shipping points for the present season up to August 16, as compared with those of the past two seasons, is as follows:

From where.	1875.	1876.	1877.
From Marquette.....	282,140	566,250	334,452
From Escanaba.....	136,520	303,054	236,500
From L'Anse.....	40,503	46,328	45,818
Total.....	459,163	515,633	614,786

It will be seen that the increase in 1876 over 1875 was 56,470 tons, and of 1877 over 1876 nearly 100,000 tons. Those interested in this ore region explain the increase by saying that it is largely of hematites and from new openings. This may be the fact, and from an inspection of the figures showing the shipments of the several mines, we do not doubt it; but what is the explanation of the fact? Why is it that, with all the conditions that surround the iron trade at present, parties who are in that trade can be found who are willing to invest their capital in these new ventures? Talk with old ore miners, and they declare there is no money in ore at present figures. If we suggest in these columns, in the mildest manner possible and with the utmost diffidence, our opinion that lake ore can be sold at Cleveland at lower prices than at present charged, we are told in no gentle words that we do not know what we are talking about. Perhaps not; but we do know that during the past two years the shipments from the ore region have increased 150,000 tons. Those interested claim that the increase is in low-priced ores, and yet they do not ruin any one. Speaking without the facts in detail before us, we give it as our impression that the failures of ore companies doing business in Lake Superior have been very infrequent during the past five years, and we believe that this trade has suffered less from the panic heretofore than any other department of the iron business.

We believe, and we have substantial grounds for our belief in the balance sheets of ore companies, that the present prices on ore give in most instances a fair profit, and in some a very handsome profit. It would be possible to sell some ores much below the present market prices and still leave a good margin. There are certain mines so situated that they cannot sell at any less, but of the good mines these are the exceptions.

Another fact seems evident: Unless this output is reduced ore will go down in price. The price of the first-class hard ores may

not be lower this year, as there seems to be a demand for all or nearly all of this grade that will be produced; but other ores have already declined, and will go still lower unless production ceases. The operators realize this and are taking steps to reduce. The *Mining Journal* announced a week or two since that "the working forces at nearly all the mines in the district are being materially reduced. The Lake Angeline has discharged one-half its force; the Saginaw has, or soon will, reduce its working force to a maximum of 50 men; in addition to the suspension of mining operations at the Michigamme, two or three small mines have shut down altogether; and we have it from good authority that two of the leading mines at Ishpeming will shortly dispense with the services of at least 300 men now in their employ."

This is an indication of the alarm and the preparation to avert the threatened danger. While blast furnace men would be glad to have ore at a lower figure, they cannot blame the ore producers for charging all they can get for their product. If manufacturers of pig iron and bar iron, in regulating the price of their products, had shown half the sense ore men have manifested in keeping up the price of ore, our market reports would now be much more agreeable reading.

Judge Kelley on the Greenback.

We call attention to a letter from Hon. Wm. D. Kelley, of Pennsylvania, which we print on another page. It is an almost unnecessary defense of the position taken in his very able article printed in our issue of the 9th inst. That Mr. Kelley is thoroughly and intelligently in earnest in his effort to bring about a reform in the financial policy of the government, no one who knows him can doubt, and we regret that he has thought it necessary to bestow undeserved attention upon the silly chatter of those who find pleasure in caricaturing him as a crazy enthusiast. That he is an enthusiast is true, but no one who has ever known Wm. D. Kelley will question for a moment the thoroughness of his study of financial questions nor the intelligence and moderation with which he advocates what he so conscientiously believes. Even those who think him wrong in his conclusions will do him but scant justice in admitting that few men have ever been more intelligently mistaken, or have reached erroneous conclusions after closer study or a longer experience in the investigation of economic questions.

Reports of the United States Commissioners to the International Exhibition at Vienna, 1873.

IV.

We are devoting a larger space to the report of Professor Thurston than we should have felt justified in giving were it not for the facts that the historical matter and the scientific, though popular, essays on the principles of design and construction of the steam engine and of machinery are of such importance and are so rarely found in publications of this class that we cannot, in simple justice to our readers, allow ourselves to pass over them as cursorily as we should otherwise have done, and that much of the information here given is of that kind which never grows old and is never out of date. It rarely happens that a writer possesses both the ability and the inclination to place before the reader plain, simple statements of the laws and facts which modern science has revealed, and to trace their bearing upon the practical work of the designing engineer and the manufacturer.

One of the most novel and yet most important classes of exhibits at the great world's fair, to which a special chapter is devoted by our author, is that which embraces the various forms of locomotive engines used on the common road. Watt proposed a steam carriage and Murdoch made a working model of the machine as patented by Watt in 1784. Cugnot, fifteen years earlier had, however, actually built and worked a steam carriage which is still preserved in the *Conservatoire des Arts et Métiers* at Paris. It was not until early in the present century, however, that steam was applied with any success in this direction. By the year 1833 a large number were in use in and around London. The introduction of the railroad put a stop to their use for the general transportation of passengers and freight. There are still, however, many traction engines built by Messrs. Aveling & Porter and one or two other British firms which are applied to the haulage of heavy loads on the common road. The author of the report has collated the results of experiments made by Mon. H. Tresca, the distinguished engineer of the French Conservatoire; of M. Servel, M. Carton, the judges of the British Royal Agricultural Society and by Professor Thurston himself. He gives complete descriptions with illustrations and dimensions of the engines used and the conclusions to which he was led by their trials. He found a 5-ton road locomotive to be capable of turning in a circle of 18 feet radius, of hauling 23,000 pounds up a grade of 533 feet to the mile on a smooth macadamized road, of pulling 63,000 pounds up a hill rising 225 feet to the mile, and of exerting a direct tractive force of about 5000 pounds. He calculated the weight which it might draw on a perfectly level and smooth road at 175,000 pounds. Where circumstances permitted the constant employment of so great power, it was as economical in first cost as horse-power, was not limited in the length of its working day, and its running expenses were but 30 per cent. of the cost of employing horses. Our author is evidently a strong advocate of the introduction of the road engine wherever it is permitted.

Our author devotes 85 pages to the description and criticism of the metal and wood-working machinery of the best of our own

the writer gives some interesting and very remarkable statistics. By careful designing and the adoption of every expedient which long experience had made them familiar with, the consumption of fuel at trials conducted at the annual shows of the Royal Agricultural Society has been reduced to two and a half pounds per hour and per horse-power in some cases. The engines of Mr. Headley, of Lowell, and of the American Engine Company, are referred to by the author as examples of equally good practice in this country. They were not exhibited.

The steam boilers at the Exhibition were not remarkable for either variety or novelty of design. Those of Adamson & Co. were excellent examples of good workmanship. The rivet holes were drilled, the sheets trimmed to size and the edges beveled by planing before fitting up, instead of being chipped by hand after having been riveted up; the flues had welded seams and Gallo-tube tubes were welded in. The Galloway boilers were also well made; the results of a trial of these boilers are given, at which they evaporated 10.82 pounds of cold water per pound of Welsh coal, equivalent to 12.88 from a temperature of 212 deg. No determination was made of the amount of water primed over with the steam, and it is therefore impossible to judge how far this evaporation was actual, and how far apparent. To illustrate the comparative efficiency of the sectional forms of boiler, the author gives an abstract of trials conducted under his own direction, and with exceptionally complete arrangements for determining the amount of priming. They were found to give an effect equivalent to that due to 70 per cent. of the total thermal value of the fuel.

Berryman's very ingenious and effective feed-water heater and other attachments to the steam boiler are described, and the reader is shown how to calculate the gain in economy of fuel which may, in any given case, be expected from their use.

The theory of that wonderful instrument, the Giffard injector, is given very concisely; and the general principles of its action are stated so plainly that the reader cannot fail to comprehend them. For a more extended treatise on this apparatus we would refer our readers to a little volume in Van Nostrand's Science Series. Finally, the principles of steam boiler construction are summarized in two pages, and so completely that no one who is capable of understanding the simple rules given can fail in the attempt to make a boiler that shall do, at least, satisfactory work. Steel of the "mildest" type is recommended as the best material for boiler making, and the author sharply criticizes the practice, common under our present defective laws, of permitting boilers to be used under conditions which are liable to cause disaster. He recommends a factor of safety of at least six in designing, and that the margin between the working pressure and the inspector's test pressure be very greatly increased. Taking up the subject of air and gas engines, our author first shows that the best forms of modern steam engine utilize about 85 per cent. of the heat supplied to them from the boiler in a practically available form, and that we are not, therefore, to expect much more from the common type of steam engine. He considered the adoption of the hot-air engine as probably the most promising of all the methods yet proposed for widening the range of temperature in the effort to increase the economy of heat engines. This class includes, properly, all forms of permanent gas engines. Henderson's theory of the aero-steam engine is given, with estimates of the efficiency to be expected from its use. Brayton's non-explosive gas engine, which our author considers the best form of gas engine yet brought out, is described. At a trial, made by Professor Thurston, this engine gave a horse-power on a consumption of but 32.06 cubic feet of gas per hour and developed its full rated power. The next best gas engine, which is also described, is that of Otto & Langen, which consumed 38.10 cubic feet. At a later trial by M. Tresca, however, the latter consumed very nearly 50 feet. The best performances of the Lenoir and the Hudson engines are given by the author as 70 and 74 feet respectively. The sources of the economy of the best gas engines are stated to be continuous, rather than explosive, combustion of the gases and high piston speed.

Treating of water wheels and other hydraulic motors, the relative cost of water and of steam power is compared. The principles of construction with a view to efficiency are stated, and the exhibits are described. Briefly stated, the principles to be observed in construction are to so design and proportion the apparatus that the water shall enter the wheel without shock, pass through the buckets without becoming broken into eddies, and finally leave it with no more motion than is necessary to enable it to fall clear of the wheel without being struck by the following buckets. The best speed of turbine wheels is usually, approximately, one-half that of the stream as it enters the wheel.

In a short chapter on pump all of the well-known steam pumps are described, as exhibited at the Exposition, and the construction of the Cameron, the Selden and the Earle pumps illustrate their construction. Probably the most valuable part of this section is the summary of the principles of construction of what our author asserts to be the misnamed class of "centrifugal" pumps, which the less centrifugal force comes into play the more efficient the pump, usually. It is shown that the form of vane should be trapezoidal in the plane of the axis and a spiral in the plane of the disk. The method of receiving and transmitting the water is subject to the same laws as were shown to govern the action of the turbine. Among others, the great pumps built by Messrs. J. & H. Gwynne & Co. to drain the Ferrara marshes are described. They are centrifugal pumps 5 feet in diameter, mounted in casings 15 feet in diameter, driven by engines having cylinders 28 and 47 inches in diameter, and furnished with steam from boilers of 750 feet of heating surface. They are expected to raise 2000 tons of water per minute to a height of 12 feet.

The best portable engines at Vienna were in the British section. Of their performance

and foreign builders. He states that the principal attraction to the professional visitor was found in the exhibits of Sellers & Co., the Brown & Sharpe Mfg. Co. and the Pratt & Whitney Co., from the United States, of Sharpe, Stewart & Co., Dunham & Co., and one or two others among the European exhibitors in the department of metal-working machinery, and of B. D. Whitney, Fay & Co. and two or three British firms making wood-working machines. European copies of American machines were seen in all sections of the Exhibition. British and American builders are closely competing, the one excelling in the strength and solidity of their tools, the other in ingenuity and the special adaptation of mechanism to certain kinds of work. Those of our machine builders who are named are, however, not excelled by any foreign makers in any respect. Very complete descriptions are given of the principal exhibits, and a very large number of illustrations distributed through the chapter lend both interest and intelligibility to the text. Our manufacturers and users of wood-working machinery will find some valuable suggestions prompted by a study of the exceptionally complete account of the tools of the British tool makers, Ransome & Co.

In the last chapter of Part I. of the Report we find concise accounts of the textile and miscellaneous machinery exhibited. Almost nothing was sent from the United States that properly falls under this head. The most prominent exhibitors of standard textile machinery were Platt Bros. & Co., and one or two other British firms, and Bede & Co., of Verviers, Belgium. The Avery wool-spinner, invented by Mr. Luther W. Felt, exhibited in the United States section, attracted much attention and very favorable criticism from experts. The independent picker motion of Mr. L. E. Ross, of Providence, R. I., is very highly commended. Of the sectional forms of boiler, the author gives an abstract of trials conducted under his own direction, and with exceptionally complete arrangements for determining the amount of priming. They were found to give an effect equivalent to that due to 70 per cent. of the total thermal value of the fuel.

Part II. of Thurston's report contains

an account of European manufacturing districts, visited by him after his departure from Vienna, and a comparison with the observations made by him on earlier visits. Our readers must consult the report itself to be able to appreciate the amount and value of the statistical and other information thus collected, and especially that relating to Swiss and German manufactures. The immense establishments of Krupp in Prussia, of Cockerill in Belgium, and of Schneider in France, and their products, are described at considerable length. The great iron-making districts of Great Britain are described; and considerable space is given to naval architecture, to iron shipbuilding, and to ordnance. Whitworth's method of making "compressed steel" is illustrated, and it is stated that he has made a metal capable of carrying a load of 45 tons per square inch, and of elongating 25 per cent. before breaking. A report on the Whitworth ordnance, which is also here described, was made by Prof. Thurston to the navy department several years ago (1870). It is surprising that no attempts have been made by our government to utilize a method which, as our author states, is "philosophical, mechanical, effective and economical." Referring to the various methods of improving the quality of metals used in ordnance construction, he says: "These experimental investigations and theoretical deductions, of national importance as they are, are of hardly less interest and importance in their bearing on the arts of peace. For many applications in mechanical engineering a material which is of value as a gun metal is also essentially important, and the engineer in general practice watches the progress of improvement in ordnance with scarcely less interest than the engineer whose special work is the manufacture and use of ordnance. Both, also, are equally interested in attempts to introduce materials, like cold-rolled iron, the softer steels, cold-rolled or 'steel' bronze, phosphor bronze and compressed steel, which give promise of aiding them in their attempts to produce machinery and structures more perfectly combining strength with lightness, or guns which are strong, reliable and efficient. In all directions, the progress of improvement is checked by the attainment of a limit set either by the weakness of the materials of construction or oftener by their deficiency in resilience. The improvement effected by the processes just referred to would seem to be largely due to the reduction of that porosity which is the invariable characteristic of the cast metals as ordinarily produced. The experiments of the writer, and the results of many tests of commercial materials in the Mechanical Laboratory of the Stevens Institute of Technology, indicate that even with the best of ordnance bronze, defects of structure occur which must detract greatly from their value. It would seem probable that solidification under compres-

sion, and other methods of securing density and homogeneity, may prove useful in many cases not yet thus treated."

Foreign Tariffs.

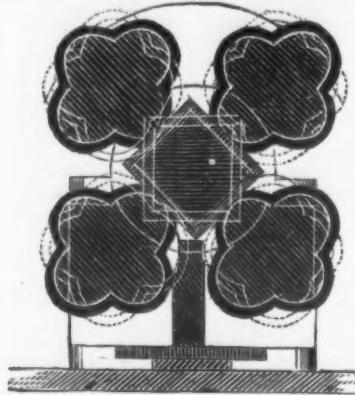
The *British Trade Journal* says: "Mr. Fawcett some time ago moved for a return of the import duties charged on British goods by various foreign states. The Statistical Department of the Board of Trade frequently publishes information of this kind, but seldom in a very accessible form. The return it has made to Mr. Fawcett's motion is, however, very convenient and compendious. It tabulates the various rates and percentages of duty charged on our exports. There are 14 of our principal foreign markets included in the list—Russia, Sweden, Norway, Denmark, Germany, Holland, Belgium, France, Portugal, Spain, Italy, Austria, Turkey and the United States. In glancing over the comparative table we have first to observe how very few articles are free. Russia shows only one, and that is coal. On silk there is a nominal duty of 1 per cent., but everything else which the Russians purchase from us has to pay from 10 to 90 per cent. toward imperial taxation, including the cost of the present war. Our good cousins, the Americans, do not have a single free article of British manufacture. The lowest duty they levy upon us is 14 per cent., and the highest is cent. per cent.—Jewish interest, in short. The largest number of free items appear under the head of Holland. The Dutch take our cottons, linens, silks, wools, iron, copper, tanned leather, alkalis, coals and herrings without taxing themselves for them. On cotton the heaviest duties are levied by the United States—from 53 to 85 per cent.; the next highest, Spain, 51 to 64 per cent.; then Russia and Portugal, 23 to 38 per cent. The Belgian duties range from 4 to 10 per cent., and nearly all the others are under 10 per cent. Among the most moderate are the Turkish duties, which average less than 7½ per cent. This is the standard duty in the Turkish tariff, there being only two considerable exceptions to it—coals, which are charged 20 per cent., and oil seed 14 per cent. Linens are charged, in the United States, from 35 to 40 per cent.; in Russia, 14 to 35 per cent.; in Portugal, 13 to 31 per cent.; in Sweden, 8 to 12 per cent., and everywhere else under 10 per cent. In woolen goods the range is from a nominal ½ per cent. in Germany to 85 per cent. in the United States. On these Russia is content with a levy of 13 per cent. On iron she requires from 17 to 50 per cent., while the United States are not sufficiently protected without from 42 to 83 per cent. British paper has to undergo much harsh treatment at foreign custom houses. The Americans exact from 20 to 35 per cent. upon it, the Russians 53 per cent., the Portuguese 42 per cent., but other foreign buyers tax themselves only about 10 per cent. The article which has the hardest battle to fight in international trade is sugar. It is enormously handicapped in all European tariffs, with the exception of Turkey, which, having no ambition to refine its own sugar, and a large capacity for dispensing with the article, is content with its usual 7.20 per cent. Russia levies a protective duty of 90 per cent., France about the same: the United States, 75 per cent.; Portugal, 85 per cent.; Holland, 70 per cent.; Norway, 60 per cent., and so on down to 34 per cent. (Italy), which is apparently the lowest. Beer follows the fate of sugar as regards international competition. It has to pay 118 per cent. in Portugal, 80 per cent. in Russia, 75 per cent. in the United States, and down in the descending scale to 8 per cent. in Denmark. It may be too early to anticipate the economical effect of the present war, but one broad result needs little foresight to recognize. Whatever portion of the valley of the Danube may pass from under the Turkish to the Russian tariff will have its customs duties increased, on an average, eight-fold."

Roofed with Gold.—One of the Philadelphia papers has been investigating the subject of gold in the dirt upon the roof of the Philadelphia mint. Its report we give below, but we are somewhat skeptical in regard to an ounce of gold from four ounces of dirt. That part of the story is somewhat large even though it be 25 years old. "Just twenty-five years ago, when Mr. Eckfeldt was Assayer of the United States Mint in this city, he submitted the dust upon the roof of the building to an assay. The startling result of the curious experiment was that he obtained one ounce of standard gold from three and eight-tenths ounces of dirt. Some of the gold obtained in this singular manner is now exhibited as a curiosity in the office of the Assayer. A few weeks ago Director Pollock ordered the gold mine on the roof to be worked again. With some difficulty this was done in a proper manner and the dirt, dust and deposits of a quarter of a century, to the amount of 1732 pounds, were removed. This has just been tested in the usual way and has yielded 42 ounces of standard gold and 96½ ounces of standard silver, the total value of both being about \$850. On the whole the roof of the mint may be said to contain 'pay dirt.' The roofing of the building is made of asphalt, and as it softens in the sun the little particles of metal come upward in the smoke from the furnaces and, carried out of the windows below by the wind, are lodged on the roof, where they become imbedded and remain until extracted by the assaying process. Every week the floors of the mint are carefully swept, and the accumulations preserved. Once a year, prior to the settlement of accounts, the woodwork of the refining room and the leather gloves of the workmen are burned to ashes. This, together with the year's sweepings, is conveyed to the sweep cellar, where it is ground in a mill and sifted and washed in a machine, the pulverized metal being caught up by mercury. The residue is then dried, barreled and sampled and sold to sweep smelters, who buy it for from fifteen to twenty-five cents a pound, according to the amount of precious metals contained in the samples. So far this year about 260 barrels have been sold, a large proportion of which was purchased by a London firm.

New Patents.

We take the following abstract of new patents, recently issued, from the official record:

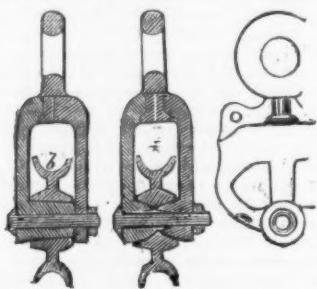
MACHINE FOR MAKING RECTANGULAR BANDS.
To M. Blakey, Elmo, Pa.—July 3.—The heated blank, of suitable size, fed between the mandrel and one of the lower rolls, is deflected by the guide block, caught by the



opposite lower roll, and made to conform to the shape of the mandrel as the rolls and mandrel turn in opposite directions, the large lobes of the rolls traversing the long, and the small lobes the short, sides of the mandrel.

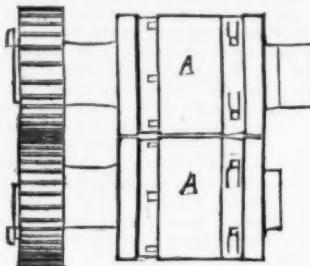
1. In a machine for making non-cylindrical bands or blanks, the combination of a series of lobed rolls and a mandrel.
2. The combination of a series of lobed rolls, a mandrel and guide block.

METAL PULLEY BLOCK.
To E. A. Scoville and W. L. Scoville, Manlius, N. Y.—July 10.—A pulley block, formed of two parts secured together and supported



at the center by the projections on which the pulley *b* runs, bolted and secured as and for the purpose specified.

MANUFACTURE OF BLANKS FOR CUTLERY.
To C. G. Hallas, F. W. Flower and E. Pearson, Sheffield, England.—July 17.—I. The rolls A A, recessed and formed substan-



tially as described, for producing blanks for table cutlery.

2. A continuous series of the rough blanks for table cutlery, rolled in one piece, with the bolsters or shoulders at regular intervals and adapted to be cut up into lengths.

192,402.—Bench Plane.—C. L. Adancourt, Lansingburg, N. Y.—June 26.

The body of the plane is provided with adjustable extension sections attached to its ends for the purpose of increasing the length of its bearing surface. The reversible cutting bit is attached by a slotted opening to and rests upon a hinged bank supported upon trunnions in the side walls of the plane, and the lower ends of the bank and bit are raised or depressed by means of an adjustable eccentric pivoted to the base of the plane, and provided with a suitable handle.

192,437.—Wire Straightening and Cutting Machine.—Irving A. Kilmer, Cobleskill, N. Y.—June 26.

A double machine, having duplicate devices at each end, and a mediate carriage for taking two wires, one from each end reel toward the other end of the machine, and straightening and cutting off any desired length of each wire. One wire is passed from one—say the left-hand—reel, through a guide and friction rollers, all adjustable to regulate tension, and between the jaws of a one-way clutch, which is held open (when closed this clutch prevents a forward movement of the wire), and on through another one-way clutch, (this clutch prevents a backward movement of the wire), and thence into a die, under a cutter and in a sliding cross-head; and thence into a clutch on one end of a carriage adapted to reciprocate lengthwise of the machine. This carriage, being moved, draws the wire forward to the right till the carriage strikes the right-hand sliding cross-head, which it presses forward close against the right-hand table. Now, another wire, which has been led from the right-hand reel and put through duplicate guides, wheels, and clutches on the right-hand table, and into a duplicate die in the right-hand sliding cross-head, is, by the repression of the cross-head, by the carriage, made to project from the die with enough exposure that it may be, and is, seized by the duplicate clutch of the carriage; also, when the carriage strikes the cross-head it closes the first clutch on the first mentioned wire, and so prevents that wire from moving forward, and since the carriage clutches the advance end of the same wire, and advances to repress the sliding cross-head, that wire is straightened (and it may be stretched) between the two clutches. The carriage now starting backward, a spring hook on the right-hand table opens that clutch of the carriage which holds the advanced end of the first wire, and that end

AMERICAN SCREW CO., Providence, R. I.

Manufacturers of

IMPROVED Gimlet Pointed Wood Screws, Patented

May 30,

1876.



After forty years' experience we offer to the trade our Centennial Screw, patented May 30, 1876, as the best we have ever known.

The method of manufacturing is also patented, and we are changing our machinery as fast as possible, to manufacture the Improved article only. To introduce them, they will be sold at same price as the old style screw.

The new screws will be packed in manila colored boxes with new label covering end of box, and enlarged figures showing plainly contents.

To distinguish this screw we have adopted a trade mark, which is also secured to us.

1776.



Estimated to be FIFTY PER CENT. stronger than a screw as commonly made.

The above drawings show the progress of screw making from the old blunt point to style now adopted.

Experience has shown that the weak point of screws, as formerly made, is at the heel of the thread, where all the strains of forcing the screw into the wood naturally concentrate.

To avoid the sharp angle existing in the old style of screws has been the aim of all manufacturers, but every expedient hitherto adopted has proved as objectionable as the evil complained of.

It will be seen in our new screw that not only is the sharp angle avoided, but the strength very much increased, as illustrated above. See sections at lines.

CLAIM.

"A Pointed Wood Screw having the outer periphery of the thread upon its body cylindrical, while a portion of the body below the thread and near the neck is conical, the remainder of the body to the point being cylindrical, and yet having all the thread brought to an edge of a constant angle, without jogs in the paths between the threads, substantially as described."

of the first wire drops free, the wire remaining sustained in the die in the left-hand cross-head, and being kept from retrogression by the second clutch on the left-hand table. The carriage, continuing to recede to the left, not only draws the second wire to the left, as before the first wire was drawn to the right, but also, by a cam on it striking a lever, actuates a cutter to cut from the first wire the straightened portion, which falls free from the machine; carriage moves on leftward, takes up the bight of the first wire, goes to the right with it, and on its way cuts a straightened length from the second wire, and so on. Should either wire fail to unwind, its reel moves inwardly, and shifts the driving belt on to a loose pulley, and so stops the carriage.

192,824.—Gauges for the Manufacture of the Chasers of Screw-Cutting Dies.—John Grant, Hartford, Conn.—July 10.

Seats corresponding to those of the die in which the chasers are finally placed are formed on the sole-plate. The threads of the chasers are made to coincide with those of a stem projecting from the sole-plate, and the chasers are then removed from their seats and placed in the die-plate formed for their reception.

192,909.—Electrical Apparatus to Indicate Overstrain or Weakness in Roofs, Bridges or Other Structures.—John Forbes, Dartmouth, Halifax, Nova Scotia, Canada.—July 10.

A means for obtaining a prompt indication of the unsafe condition of such structures.

193,227.—Mine Pump.—E. Daggett, Salt Lake City, Utah.—July 17.

1. In a mining pump the combination, with a reciprocating pipe, a pump barrel and suitable valves, of an auxiliary or water-balance chamber, substantially as described, whereby the weight of the pipe may be wholly or partially balanced.

2. In a mining pump having a reciprocating pipe, the combination, with said pipe, of a discharge tank provided with a stuffing box in its bottom for the passage of the pipe.

193,228.—Mine Pump.—E. Daggett, Salt Lake City, Utah.—July 17.

To stationary pump barrels with suitable valves and two reciprocating pipes which operate simultaneously, so that the several barrels and pipes co-operate as one pump, the water being forced from the lowest pump to one next above, and so on until it can be freely discharged at the top of a shaft, or any lower point from which flowage is desirable.

1. In a mine pump two or more stationary pump barrels placed one above the other and provided with suitable valves, in combination with two or more reciprocating pipes which are connected to each other by tapers, and operate simultaneously with their respective pump barrels.

2. In a mine pump the combination, with a pump barrel, a reciprocating pipe and suitable valves, of a tank mounted upon the upper end of the reciprocating pipe and moving with it.

193,236.—Manufacture of Anchor Points.—Wm. N. Fisher, Boston, Mass.—July 17.

The arm approximately shaped together with the palm. Both, at a welding heat, are placed in proper-shaped dies, welded together and shaped, and the point is subsequently sheared in other dies.

193,252.—Machine for Milling, Pointing and Shouldering Keys.—Henry G. Hotchkiss, New Haven, Conn.—July 17.

The tools for pointing, milling the body and shouldering the key are advanced to their work, in the order named, by means of the cam acting on pins on as many slides, the first passing through the hollow spindle and chuck, the two last pivoted centrally beneath the key on a common shaft. The milling jaws are connected to their slide by links, and open or close as the slide advances or recedes. One of them is rabbeted to receive the shouldering tool, which has a spring connection with its slide.

How Mr. Gowen Means to Treat the Miners.—With regard to the adjustment of wages of coal miners for August, Mr. Gowen writes to the committee as follows: "We have received notice that three of our colliers have been drawn among the five to determine the rate of wages for August. Under our agreement with the men, the price of coal of the preceding month establishes the rate of wages for the succeeding one, and thus the wages for August would be based upon the price of coal in July, which was probably the lowest of the year. As there has already been some advances of prices in August, and will probably be a much larger advance in September, and as our men have behaved so well during the recent troubles, I feel disposed to give them the benefit of the advance of prices as they occur, and not to take advantage of the strict terms of our contract, under which we would have the right to pay August wages based upon July prices. We will, therefore, not make any return at the usual time of July prices, but if the men continue to behave as well as they have done, we will, at the end of August, return the higher prices of that month for the month of August and so on during the year, and I have but little doubt that the individual coal operators will unite with us in this course."

Fulton's Folly.—On the 18th of August, 1805—72 years ago—Robert Fulton took his departure for Albany on board of his venture, the Clermont, and satisfied the people of the United States of the possibilities of steam navigation. He had been superintending the construction of the boat for a long time, and people looked upon Fulton as a fool, and the boat itself was christened by the mob "Fulton's Folly." It did not daunt his enthusiasm in his project, however, and the day that she was launched he made promises concerning her future triumph which caused his best friends to look upon him as demented. It is hard to describe at this day the surprise of the thousands of spectators who witnessed his first voyage on the Hudson. They saw the wheels of the vessel revolve slowly at first and the craft glide up the river, and when she passed the sailing vessels their astonishment was such that they looked upon Fulton's discovery as the work of the devil and to be denounced as such.

N. & G. TAYLOR CO., Philadelphia. TIN PLATE.

We have the LARGEST Square Sheet of Tin Plate ever made, 144 inches long by 48 inches wide.

ALSO,

The SMALLEST Sheet of Tin Plate ever made, 6 inches wide by 10 inches long.

Between these extreme sizes we have open for inspection our immense stock of odd and regular sizes of Tin Plates of all grades, qualities and thicknesses, ranging from number 38 to number 12 gauges.

In addition to the above—and our assortment of special Patterns, Splayed Boiler Sheets, Milk Pan Tin, Stove Door Lining Plates, etc.—we always carry in large stock,

CIRCLES of Every Description,

From 6 Inches to 40 Inches, 1C to 8X Thickness, No. 30 to No. 20 Gauge, 3 Ounces to 30 Pounds Weight.

These are all stamped out, by correct dies, from the very finest quality of Charcoal Plates, and afterward tinned.

Send for our illustrated catalogue, descriptive circulars and price lists.

When desiring any information on Tin Plate, it will be to your advantage to write us.

N. & G. TAYLOR CO., Philadelphia.

**CROSSLEY'S
Patent Stave Jointer.**



The most Simple, Durable and Perfect Jointer in four sizes, joining from 16 to 36 inches in length. In use from Month to Month, is used by the largest stave and barrel manufacturers in the world. Will pay for itself in 90 days in saving of time and timber over any Saw Jointer ever used. Send for circular to.

**H. A. CROSSLEY,
78 Columbus St., Cleveland, O.**



W. & J. TIEBOUT,

MANUFACTURERS OF

Brass, Galvanized and Ship Chandlery

HARDWARE.

290 Pearl Street, NEW YORK.

WILSON BOHANNAN,

Manufacturer of Patent

**BRASS
Pad Locks,**

FOR

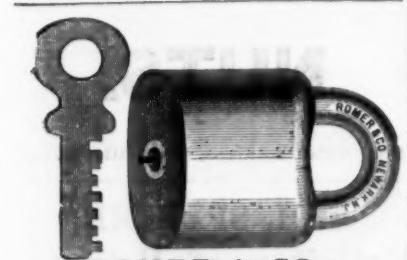
Railroad Switches,
Freight Cars,
AND THE HARDWARE TRADE

All sizes, with Brass and Steel Keys, with and without chains.

PASSENGER CAR LOCKS,
Bronzed, Nickel-Plated and Japanned.

BROOKLYN, N. Y.

Catalogues and Samples sent upon application.



Established 1877. Manufacturers of Patent Scandinavian or Jail Locks, Brass Pad Locks for Railroads and Switches. Also, Patent Stationary, R. R. Car Door Locks. Patent Piano and Sewing Machine Locks.

141 to 145 Railroad Avenue, NEWARK, N. J.

Illustrated Catalogue sent on application.

Curiosities of British Trade-Unionism.

The difficulties in the labor market have had, among other effects, that of bringing forward a number of grumblers at the manner in which the British workman now pursues his calling. Thus a correspondent of the Liverpool *Courier* narrates the following cases which have come within his "own knowledge": "A gentleman in Warwickshire, six miles from a town, required some alterations and repairs to his house. The first day the workmen came out he found them on his lawn under a tree smoking, and on inquiring why they did not set to work, was told the 'club' allowed an hour for every three miles from town. The railway brought them in 20 minutes; they therefore had an hour and forty minutes to spare, and would be fined if they started work before the time. Recently I required four or five new bricks in the back of my kitchen grate. Two men came to do the job. I asked what the second man was for, and was told the 'club' required that each brick setter should be attended by a laborer, 'but this chap can't do nought at this job, but I should be fined if I come without him.' When the town hall in one of the pottery towns was being built, the architect procured certain ornamental bricks from Kent. The club declined to allow the workmen to use them, because they came from a distance beyond the radius prescribed by its rules. The men were ordered to strike, and the building was finished by men imported from France, and for some time military protection had to be given to the strangers. When Watts & Co., of Manchester, were roofing their new warehouses, the contractor used horse-power to hoist the slates. When a third of the work was done the club ordered the slating to be undone, the slates taken down and carried up ladders by men. The contractor refused, the men were ordered to strike, and the contractor and his partner finished the job with their own hands, and became liable to heavy forfeit for non-performance of contract to time. Recently two new shops were erected in Manchester fronted with Bath stone. Every stone arrived ready for fixing, but the club declined to allow the stone to be used unless the dumb show of 'tooling' was gone through on the ground, and the men paid the same as though they had actually toolled it. This was refused; the men were ordered to strike, and the work was finished by Belgians. I could fill a book with similar instances of union tyranny. Workmen have repeatedly told me that they won't bring their sons up to their trade, as no union man has any chance of rising above one miserable dead level; and that as regards pay, the scamp and 'duffer' is as well off as the skilled man and the sober man, and that inevitably the quality of British work must deteriorate. Indeed, that it has deteriorated during the last 30 years is evident to any one old enough to remember the work done 30 years ago, or intelligent enough to observe the difference between modern work and the work of our fathers' time."

Another gentleman, writing to the *Manchester Examiner and Times*, says: "A short time ago a friend of mine had a bit of joiner's work that required doing, for which 1/6 would have been an ample payment. One day a joiner came to the job, but speedily adjourned to an adjacent beer house, and his visits to that place of refreshment were repeated at short intervals during the day. My friend thought this style of thing looked more like play than work, but he was undeceived when he received a bill of 7/6 for 10 hours' 'work,' at 9d. per hour. This case clearly shows who will have to pay the additional sum per hour should the joiners succeed in the strike in which they are now engaged; and it will not be denied that in most trades increased wages mean greater idleness, with less work, and that of an inferior quality."

The Practical Use of the Telephone.

Mr. C. A. Cheever, agent for the telephone in this country, has lately placed in this city several telephone instruments and wires. One of these connects his office with the Champion Burglar Alarm Company's office at Thirteenth street and Broadway, by a circuitous route, using one of their old telegraph wires, between three and four miles in length, as the medium of communication. Mr. Cheever has another wire running to Broad street, in communication with an establishment engaged in the construction of telegraph lines. Another line connects Mr. Cheever's office with the office of Dickerson & Beaman, lawyers, in the Staats Zeitung building. The reporter enjoyed a conversation with Mr. Beaman over this wire, and found that words could be transmitted at the rate of about 200 a minute. Mr. Cheever is erecting a line for the Clyde Steamship Co. from its office in Bowring Green to Pier No. 2, North River, from which its steamships sail. This is a circuitous line about five miles in length. The piers of the Brooklyn Bridge are also being connected by telephones with the superintendent's office, so that all the movements of the 'travelers' in carrying the wires across from pier to pier can be communicated and directed without the use of signal flags as at present. The current of sound in these telephones is carried by a single wire in either direction. All that it is possible to do in ordinary conversation between two people sitting within 2 feet of each other in a room can be done at the distance of 5 or 10 miles, or even a greater distance, by simply raising the voice and speaking a little slower than naturally. The telephone instruments themselves are very simple, consisting of two wooden tubes, one of which is placed at the mouth, the other at the ear. The extension of these telephones all over the city in place of the electric telegraph is thought to be only a question of time.

A new material called eburite, apparently capable of extensive employment in the arts, is made in this way: To the dust of bone or ivory, gum tragacanth and any suitable coloring matter are added. The whole is then pressed. Sometimes a very intimate union is formed between the particles of bone or ivory by heat and pressure without any gum

The Patent Automatic Stokers

which were shown by Dillwyn Smith at the Centennial Exhibition in the British section, and obtained the medal and highest award, are now offered to the users of steam in the United States, by the "United States Automatic Stoker Co." under a license from Dillwyn Smith, for use on land boilers, with full confidence that the satisfactory results obtained in Great Britain and on the Continent of Europe (where over 1200 of them are in use), will be fully realized here. Some of these results are: The generation of from 25 per cent. and upward of steam from a given grate surface above what is obtained from the same quality of fuel fed by hand. The lessening of the cost of steam from 10 to 30 per cent. from being able with the Stokers to properly burn a lower priced fuel. The entire removal of the smoke nuisance. The lessening of the labor of the fireman. Their use also materially reduces the temperature of the fire room and also prevents the injury to the boiler caused by the contraction and expansion of the plates resulting from the frequent opening of the fire doors in band firing. These and other advantages have secured their introduction into the boilers of many of the largest Mills and Iron Works in England and other countries, and we are now turning out an average of 10 machines per week. A few letters are given from some of those having them in use, the statements in which can be implicitly relied upon. For information respecting price, &c., apply to

THE UNITED STATES AUTOMATIC STOKER CO.,

DILLWYN SMITH, President, 2 Chestnut St., Philadelphia.

LAND MACHINES,

From A. M. Collins, Son & Co.'s Factory, Third and Canal Streets, Philadelphia.

DILLWYN SMITH, Esq.—Dear Sir—April 3, 1877. After several months' experience with your Automatic Stokers, we take pleasure in stating that they have proved entirely satisfactory to us. The saving in cost of fuel we estimate at 25 per cent., increased amount of steam fully 30 per cent., besides great economy in labor. Hoping you may be successful in introducing them into general use in this country, we remain

Yours, truly, A. M. COLLINS, SON & CO.

Wigan Coal and Iron Company.

Wigan, September 29, 1873.

Dear Sirs: I have pleasure in certifying that the

Stokers applied to our boilers at Kirkless have worked to our satisfaction, and have effected a saving in fuel. Be given enough to put in hand & more for the range of boilers at our Almond Pit.

I remain, yours truly, W. H. HEWLETT.

From J. R. Jones, Esq., Armonia Paper Mills, Holywell,

Dear Sirs: Your Stokers answer my purpose; without them I could use it for burning the fine siftings or dust from the stack; and those you have since erected have fully confirmed me in that opinion, for not only do we now use them, but we have had to pay for the fuel previously burnt in all, but the generation of steam is far greater than before, and we have been using one of your boilers, finding one which we can obtain, by the aid of your Machine, quite as much steam from three boilers as we previously could from the four.

Yours truly, J. R. JONES, Carson.

Horn Mill, Ashton-under-Lyne.

Dear Sirs: We have had your Patent Mechanical Stokers in our use for some time, and find they work to our entire satisfaction, and effect a considerable saving in coal.

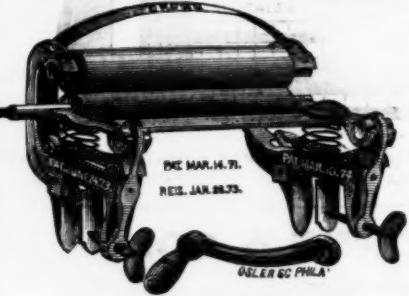
Yours, truly, OLDHAM WHITTAKER & SONS, Per W. TUOP.

Note.—They have ten double Machines at work.

THE AMERICAN MACHINE COMPANY, Philadelphia, Pa.,

MANUFACTURERS OF

SPECIALTIES OF LIGHT IRON WORK.



CROWN WRINGERS.

with Patent White Rubber Rolls, Galvanized Malleable Iron Frame Work, Bessemer Steel Spring, &c. Noted for Strength, Durability, Efficiency and Simplicity.

No. 2, Rolls 1 1/2 in. diam., 10 in. long. No. 3, Rolls 1 1/2 in. diam., 12 in. long. No. 4, Rolls 2 1/2 in. diam., 12 in. long.



CROWN FLUTING MACHINES.

with valuable improvements over other style Machines. Patent Spring Arrangement and Clamping Device. Noted for Superiority of Finish and Practical Advantages. The leading Machine in the market.

Sizes (length of Rolls), 4 1/2 inch, 6 inch and 8 inch.

Rolls with 10, 12, 15, 18, 22, 26 and 30 flutes.

Patent Convex

Fluting & Smoothing Iron.

THE STANDARD.

Applicable also to Cupboards, etc.

Made wholly of Brass, and finely finished. Each Lock has two flat, steel, nickel-plated Keys.

Dealers desiring to examine this Lock will receive a sample without charge, by addressing

The Yale Lock Mfg. Co.
STAMFORD, CONN.

Patent Convex

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Fluting & Smoothing Iron.

THE STANDARD.

Applicable also to Cupboards, etc.

Made wholly of Brass, and finely finished. Each Lock has

"The Rebellion of Labor."

To the Editor of *The Iron Age*.—DEAR SIR: Under the above caption you put the following interrogatories in your issue of the 2d inst.: "Why are these thousands idle? Why are the wheels of industry locked and the furnace hearths cold while uncounted wealth lies unutilized and the great plains of the West are white with the promise of an abundant harvest? Why is it, with wages so low that honest labor goes hungry, prices in many departments of trade are below the net cost of production?"

Sometimes questions are asked which are not intended to be answered, and sometimes they cannot be answered, but we are honest enough to think that if a fair and non-partisan answer to the foregoing were presented, with its argument, you would entertain it. We will simply refer to recent history, without entering into party politics. When *The Iron Age* first presented to the reading public the greenback system of finance, it caught the eagle eye and the far reaching sagacity of Hon. S. P. Chase, then Secretary of the Treasury. That system with some modifications was adopted by Congress to meet the then existing emergencies of our crippled financial condition. It proved to be the great panacea for the financial ills, and had it been kept in its original channel it would have floated us over innumerable sand-bars, and the panic of three years ago, and also would have obviated the necessity of answering the questions above propounded. Class legislation in the interest of the moneyed power of this and foreign countries has brought about the present condition of things, out of which spring the above interrogatories. Twelve years ago we were emerging from the most gigantic war this country ever had. The thousands of men retiring from the battlefield were distributing themselves among the agricultural fields, and pushing forward the wheels of industry, building the furnace fires, delving in the mines, and no laborer was meanly paid and none went hungry. We were entering upon a period of material prosperity. The scourge of war being removed, and no famine, pestilence, or public calamity threatened, and the people as contented and satisfied as it was possible for our ambitious and restless population to be, everything conspired to prosperity and the pursuit of happiness. But, unfortunately, just at the juncture of our anticipated recovery from financial paralysis, the monetary doctors prescribed depletion by bleeding, and through that system of treatment the circulation became irregular and local; and hence, instead of a general and healthy circulation by which the whole body politic was supplied, the patient now lies a helpless paralytic engorged with local congestion. While our circulating medium was in the hands of the masses and unrestricted by class legislation we were prosperous and satisfied, but when the retiring of the currency began and the character of it was changed from non-interest bearing debt to gold bonds bearing interest in gold, then the small veins began to show the weakness of the circulation, the small arteries showing a sympathetic action, until now there are little or no pulsations except in the great reservoirs of wealth, and hence the question, why are these things so? The specie resumption act has been perhaps the most potent of all causes that has produced our present financial lethargy. Its twin sister, the demonetization of silver, followed as a natural consequence; the non-taxability of government bonds, the commissions allowed to national banks, the extravagant donations of public lands to private interests, all in their several channels have wrought out their natural and pernicious results. There is no assignable reason other than those given above and their kindred type why we should not be as prosperous to-day as we were in 1865.

The whole country is in a state of anxiety about the solution of the specie resumption problem. If that act is carried into effect there is but one way to solve the problem, and that is that our condition must necessarily grow worse until the final sale of this government is made to foreign capitalists. From the small amount of gold—not exceeding \$50,000,000—in the United States Treasury on the 1st of July last, it is utterly impossible to obtain gold sufficient upon which to resume specie payment other than by issuing bonds payable in gold and selling them in foreign markets; hence, when that takes place we become serfs to the foreign moneyed aristocrats. Our answer to these questions and our remedy for the calamities now upon us are to return to the base line of the greenback system, and let the government issue the circulating medium in amount and kind that we had in 1867. The South is in a comparatively quiet condition, heaven's blessings have been bountifully bestowed upon us in the abundant harvests, there is no friction nor trouble throughout our borders other than that which arises from our financial condition, and with the same financial standing now that we had then we would be like prosperous and satisfied.

H.

Toughening Glass by Compression.—In the Siemens' glass works at Dresden, there is now manufactured a product which has the same properties as La Bastie's tempered glass, the strength being communicated by the pressure of metallic rolls. Plates can be made, by this method, of much larger dimensions than by La Bastie's. They have a beautiful look, and can be ornamented with the most complicated designs, at a less cost than ordinary glass. Siemens claims that glass manufactured by his process has a greater strength than tempered glass, in the ratio of 5 to 3. When broken it shows a fibrous structure, while La Bastie's is crystalline. For equal thickness the resistance of a plate of compressed glass is from seven to ten times as great as that of an ordinary plate. In trial experiments, performed before the Berlin Polytechnic Society, a lead ball weighing 120 grammes was let fall, from different heights, upon plates arranged horizontally and supported only at the four corners. While an ordinary plate was shattered by the weight falling from a height of three decimetres, the plate of compressed glass of like dimensions broke only when the weight was let fall from a height of three metres, and even then only

under the influence of many successive blows.—*Deutsche Polyt. Zeit.*; *Il Politecnico*, April, 1877.

Spontaneous Production of Protoxide of Iron.—M. Terrelle, who is at the head of the laboratory attached to the Paris Academy of Sciences, has investigated the oxidized crust which he found rapidly accumulating on the surface of the iron rods of the registers of a Siemens furnace. This furnace was of a new design. It might be supposed at first that this crust consists of magnetic iron oxide, but this substance forms really only a fourth, hardly that, of the total mass. The great bulk consists of the protoxide of iron recently discovered by M. Debray, protosulfide of iron being present in the proportion of about 1 per cent. M. Daubreuil remarks that this unexpected product, so far from being accidental, is quite normal, and occurs in spite of the strong clay lining of the rods, when they are plunged into a reducing atmosphere. The latter, according to M. Gigat, contain 64 parts nitrogen, 26 carbonic oxide, 16 hydrogen and 4 carbonic acid. The thickness of the deposit is estimated at half a millimeter a day.

L. M. Heery, a mill superintendent of Hinsdale, Mass., has by an ingenious invention much increased the capacity of the sewing machine. His machine has an arm and stand like the ordinary machine, but instead of a single needle it has three, with three separate bars to work them, but the number of needles can be increased *ad libitum*, as can also the size of the machine. Each needle sews a separate seam, sewing either straight or zig-zag, or in other ornamental shapes. All the needles can make either the lock or chain stitch, and the machine will finish a quilt or comforter or make a shirt bosom at one passage through, no matter how many sewings or lines of stitching are required. Mr. Charles Kellogg, an ingenious mechanic and inventor of North Amherst, Mass., who not long ago invented and perfected the paper bag machine, has for the last year been engaged in building a machine for fastening buttons on to cards, a process hitherto done by hand with a needle and thread, a day's work being about 40 gross for a smart workman. The machine is calculated to fasten one gross per minute on cards containing two dozen each, or 60 gross per hour, and the model for the patent office cost \$1600, though duplicates can probably be made for \$300.

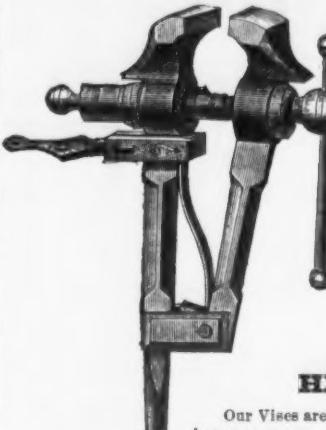
The Wrought Iron Bridge Co., of Canton, N. Y., have the contract for rebuilding the bridge over the Connecticut River, at Northampton, Mass. The bridge has a total length of 1219 feet, in eight spans, with 18 feet roadway, and will cost about \$27,000, exclusive of flooring. This company are also building a 930-foot bridge in six spans, with 16 feet roadway, at Columbus Junction, Iowa, being the longest highway bridge in the State, and have the contract for six 120-foot spans, with 18 feet roadway and 5 feet sidewalk, at Paris, Ont. They have just completed a 160-foot bridge with 30 feet roadway, and two 8 feet walks on iron piers, 25 feet high, at San Jose, Cal., and are building a 256 feet span, with 18 feet roadway, at Preston, W. Va. All of the above bridges are on the company's patented truss plans, with all wrought iron details. The company have now over 12,000 feet of bridging in process of construction, and are running their work day and night, giving employment to over 300 men. They are making extensive additions to their shops and machinery, to meet their large increase of business.

The Plattsburg (N. Y.) *Republican* gives the following particulars of a new manufacturing enterprise in that village: "Ground has been broken for the erection of a charcoal blast furnace. The furnace is to be 30 feet square and of a capacity of turning out from 10 to 15 tons of pig iron per day, which is then to be reduced in the forge fires and hammered, making a superior quality of malleable iron. The process is similar to that which has been in use in Sweden for many years, by which the celebrated Swedish iron is produced, and a few establishments of the kind are in operation in Pennsylvania. The advantage claimed for this process over that by the Catalan forge is that the heavy expense and waste of 'separating' is avoided, and the iron produced by it is of a much purer, more uniform and superior quality than that made in the ordinary Catalan forge. Ordinary 'chuck' ore will be used, crushed to about the size of hen's eggs, and after melting the pigs will be heated to nearly a melting point in ovens attached to the ordinary forge, and by the escape heat, after which they are reduced in the open fire and hammered like ordinary blooms. It is claimed that 250 bushels of charcoal will be sufficient to manufacture each ton of hammered iron; 125 in the furnace and 125 in the forge. Steam power will be used in running the blast furnace, the escape heat of course being utilized; but the water power as at present arranged will be used in operating the hammer and forge blasts. The forges are to be reconstructed and furnished with ovens for heating the pigs by the escape heat. It is expected that the new furnace, which, with the forges, will employ about 50 men, will be in operation by December 1."

Toughening Glass by Compression.—In the Siemens' glass works at Dresden, there is now manufactured a product which has the same properties as La Bastie's tempered glass, the strength being communicated by the pressure of metallic rolls. Plates can be made, by this method, of much larger dimensions than by La Bastie's. They have a beautiful look, and can be ornamented with the most complicated designs, at a less cost than ordinary glass. Siemens claims that glass manufactured by his process has a greater strength than tempered glass, in the ratio of 5 to 3. When broken it shows a fibrous structure, while La Bastie's is crystalline. For equal thickness the resistance of a plate of compressed glass is from seven to ten times as great as that of an ordinary plate. In trial experiments, performed before the Berlin Polytechnic Society, a lead ball weighing 120 grammes was let fall, from different heights, upon plates arranged horizontally and supported only at the four corners. While an ordinary plate was shattered by the weight falling from a height of three decimetres, the plate of compressed glass of like dimensions broke only when the weight was let fall from a height of three metres, and even then only

This device has often been complained of as inconvenient. It is known to be safe to any in the market, while it has this advantage over all others, that any one not used to it can learn to use it in a moment. It is common lock—when set a combination lock—and also an alarm lock.

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The advantage claimed for this Vise over the ordinary patterns is in the ease with which it is adjusted to whatever angle may be required.

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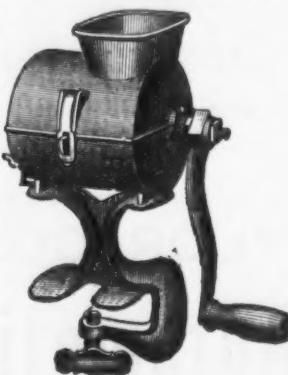
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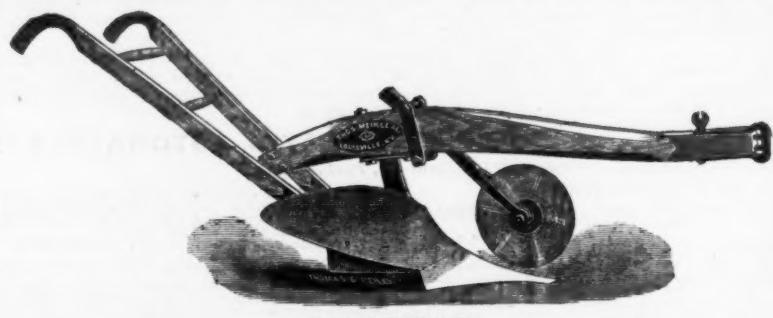
Our Vises are warranted to do more work than any other make. No broken boxes or screws.

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MANUFACTURERS OF

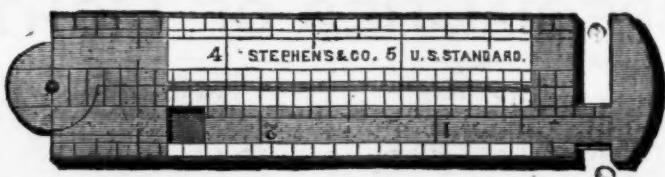
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Extracts from the Report of Col. Sandford.

(Concluded.)

METAL WORKING TOOLS.

In a most exhaustive paper by John Anderson, LL. D., C. E., on Machines and Tools for Working Metal, Wood and Stone, we find the following very pleasant preliminary remarks:

The exhibition of machinery at Philadelphia in 1876 was a great event in the history of applied mechanics; as a whole it was a magnificent display of refined mechanism, rich in new ideas, full of fresh instruction, and most encouraging in promise of the future. Past inventions were presented under new and unlooked-for arrangements, the old ideas leading to fresh devices. It was most suggestive in presenting new forms to materials, new constructions containing original combinations of matter, in alliance with force or mechanical energy; novel applications of ingenious mechanism to useful purpose in art and manufacture, all conducive to the saving of labor, or the economy of materials, and all striving to attain excellence in production, combined with good proportion in strength, harmony and beauty in outline.

The display of machinery classed under the name of "Machine Tools" was perhaps the most remarkable feature of all. As a collection of tools it has never been equalled, either for quantity or for quality or for fitness. The grand and united effect which it produced was no mere result of repetition according to well-known forms of construction, but was due to abounding novelty, originality and progress. This department of the Exhibition had a strongly marked American character, and can hardly be regarded as an international competition. Other civilized countries, it is true, took part therein, but the aggregate did not equal one-fourth of the articles exhibited by the United States. There was also marked evidence of patriotic spirit in the prodigious efforts made by individual citizens and firms to sustain worthily the mechanical reputation of their country. The excellence and originality of the machine tools displayed by many firms impressed stranger immensely, and however much he may have seen of former international exhibitions on the grand scale, these impressions survive.

All the machines were subjected to the most severe tests, only two of the exhibitors, one from Canada and one from France refusing to permit the experiments, and the words of Dr. Anderson have therefore great weight. He thus speaks of some of the finest exhibits:

The display of machine tools made by the United States was so vast, that only the more salient points can be noticed in a brief report. It showed certainly that the past century has not been passed in idleness, and, judging by the enormous stride made by them during the past few years, it showed that they have been intelligent students of the best European authorities. It is true to say, however, that the Americans, as a rule, are not copyists; the inventing of clever devices, and tools for saving labor, seems to be their natural forte, and worthy of the old stock, probably quickened by the peculiarly favorable circumstances under which they live.

It was the display made in this section of the Exhibition which most conspicuously brought out the enormous strength of America as a producing power. More than a hundred exhibitors had each a large exhibit that commanded the admiration of all who took the trouble to examine it in detail. In this vast array there were machines for all purposes; small-arms ammunition, sewing-machines, clocks, watches, and all the branches of machine making and engineering, and almost all were finished in a style superior to that of any former exhibition.

Probably the most exquisite set of machine tools ever made was that exhibited by the American Watch Company of Massachusetts. No mere words can convey an idea of their high standard of excellence; they must be carefully examined, handled, and felt. What the Whitworth standard gauges are to true circles and exact dimensions, these lathes and tools are to all forms required in the manufacture of watches. Add to this, great convenience in arrangement and fitness to produce the parts of a watch so exact as to be almost interchangeable.

The display of Ames & Co., of Chicopee, Mass., the Putnam Co., Brown & Sharp, and Mr. George Corliss, of Rhode Island, are next mentioned, and then Dr. Anderson continues:

The greatest display of machine tools, however, and that which dwarfed all the others in the tool specialty, was made by the celebrated firm of W. Sellers & Co., of Philadelphia. This collection of machine tools was without a parallel in the history of exhibitions, either for extent or money value, or for originality and mechanical perfection.

Altogether there were about forty distinct machines, most of them large and many of them of gigantic proportions, but all characterized by extreme refinement to the minutest details. Besides, it was thoroughly national in its character, and pre-eminently worthy of the Centennial.

A steam hammer shown by this firm was remarkable for the elegance and originality shown in several of its details, in the form and arrangement of the hammer proper, for the manner in which the hammer head is secured to the hammer, affording great convenience in fixing and unfixing. Also, for novelty in the mode of working the steam valve, and several marked improvements in connection therewith. One of the machines was for producing flat surfaces, and, although a new conception, was here developed into a practical tool for the engineer. Sir J. Whitworth was the first to develop the true surface-plate system, which has hitherto been arrived at by planing and scraping, depending on volition for the ultimate perfection of a true plane. In this new idea the true surface of a perfect table is transferred to other surfaces by moving the latter over a grinding instrument in the middle of and on the same true plane.

The most important feature is this, that the surface to be made true may be of any degree of hardness, even chilled cast iron or hard cast steel, thus opening up a new field of endless application for slide valves, and

for many parts of tools and machines where extreme hardness is a virtue. In lathes of all kinds this firm is remarkable for mathematical accuracy, and all were furnished with original devices, which enable a zealous workman to develop the produce of the lathe to its utmost capacity, yet without physical effort. By the introduction of an under V within the bed the shifting head is always drawn to the same straight line, thus avoiding the necessity of a tight fit in the shear and its consequent disadvantages. Their system of feed motion is admirable, a simple combination of disks, whereby the feed rate may be altered from one extreme to another, or to any intermediate point, by a mere touch.

Their planing machines are famous in Europe, and are now being copied in all countries. One of the largest ever made, which planes automatically in three directions, is now under construction at Philadelphia for a Russian arsenal. These planing machines are distinguished for directness in the transmission of power. The trammels which have hitherto kept engineers to spur or bevelled gear are broken through; they employ the old gear only when it is the best for the purpose, but if not, they devise a new and special gear going straight to the point in whichever direction it may be. This is shown in several of their machines, including the planing, and naturally raised controversy among experts. The devices employed to give the feed motions at the proper point and to avoid a struggle between the open and cross belts at the reversing moment are most ingenious, and were much admired by the judges. One of the most striking features of the American section is the variety of special tools for all sorts of purposes. In this also they take the lead. One example was a lathe for brass work employed in making the water injector for steam boilers. Considered as a combination of clever devices to accomplish a definite object, it was a fine tool. It enables an intelligent man to accomplish more work in turning, boring, screwing or fitting than is possible in an ordinary slide lathe which is intended for general work. Besides, it is less dependent on the workmen for accuracy.

It was the general opinion among engineers at the Centennial that this class of machinery will have to be more and more resorted to as competition intensifies, because it reduces cost of production and raises quality. Messrs. Sellers' gear-cutting machine is also well known in Europe.

Dr. Anderson also describes the Batho nut-shaping machine, the Ralph H. Tweddell hydraulic riveting apparatus and the rotary puddling machine shown by the same firm.

The collection of John Roach & Son excited great admiration. One plate, said to be the largest ever made, was 28 feet long, 8 feet 6 inches wide, by $\frac{1}{2}$ inch in thickness. A specimen of the same quality of iron worked into shape to form the head of a steam boiler was an extraordinary example of plastic malleability. It was 106 inches in diameter, and flanged 6 inches deep around the outer edge. Upon the opposite side of the plate four other flanges were worked out around four equidistant holes 30 inches in diameter, these flanges being 4 inches deep. As a piece of smithwork it was faultless. The owners, and the Americans generally, were evidently proud of such smithing. The Doctor adds: "There are few men in the world with the combination of qualities that could take in hand and execute such a piece of work for the first time. What a satire is here afforded on the modern doctrine that all men should have the same rate of pay. It was pleasant to be informed that the smith who made it was an Englishman, and it was generous of the Americans to give the information so freely."

OTHER DISPLAYS.

The firm of Hoopes & Townsend, of Philadelphia, exhibited a great novelty in punching (not shown in operation), which created a sensation among engineers from all countries, the United States included.

The articles shown consisted chiefly of nuts or other similarly perforated specimens; all were of remarkable beauty, and were given away in great profusion. These nuts had two peculiarities—they were of inordinate depth, and showed clearly that they had been punched cold. Visitors, however, did not hail this new fact in practical science; they said it was an impossibility for a $\frac{3}{4}$ -inch punch, however good the quality of steel, to penetrate through $1\frac{1}{2}$ inch of cold iron; that whatever might be the explanation, a punch of that diameter could not do it without being broken or crippled.

In time the secret leaked out, for it was no imposture. This firm, in punching, take advantage of the fluid property of solid cold iron or steel by introducing the element of time into the performance of the operation, giving to the punch only such a load of pressure as it can comfortably sustain, then giving up the reins to nature, when the instrument penetrates at a rate dependent on and in proportion to the fluidity of the mass. Hitherto the philosopher and the experimentalist have been writing upon the flow of solids, no one hearing; but here at the Centennial was the natural law made practically available; and, unimportant as it may seem, yet vast issues are bound up therein.

The seed there sown in thousands of thinking minds will bring forth many other applications in metal working, and will lead to the performance of many operations that are deemed impossible at the present time.

Dr. Anderson devotes considerable space to the interesting display in the saw mill annex, including the exhibits of Mr. E. P. Ellis, Milwaukee; Mr. Stern, the oldest maker in the United States; Mr. Richard Roberts, Mr. C. Meiners, and Mr. A. Kempt, Wisconsin. In his examination of the stone-working machinery, Dr. Anderson found much to applaud in the contributions of the Emerson Stone Saw Company and Mr. Young, of New York, inventor of the reciprocating diamond saw. Dr. Anderson, in closing his report, draws these lessons from his visit to America:

Britain and the United States are not on equal terms; by past exertion the former has become rich, the latter is still comparatively poor, but with an abundance of brain power in active exercise. America is much in the same condition as was Great Britain about half a century ago.

In this competition of tool-devising, brains count for more than wealth, and will gain an advantage; under the same conditions the two nations will probably be found to be nearly alike; both have come out of the same good stock.

Let the youth of Britain take note. Our past prosperity came by well-directed thought. As it was in times past, so now it is the same. England's future greatly depends on the intelligence and mental activity of her sons.

The judges in this department were as follows:

American—George H. Blelock, Springfield, Mass.; W. F. Durfee, Wisconsin (at 56 Broadway, New York); Professor John A. Anderson, president of Kansas State Agricultural College, Manhattan, Kansas.

Foreign—Mr. John Anderson, LL. D., C. E., Great Britain, chairman; M. le Commandant F. Perrier, France; Mr. C. A. Angstrom, Sweden; Mr. Auguste Gobert (fils), Belgium; Mr. Felts Reifer, Austria.

SEWING MACHINES.

Mr. Frederick A. Paget, C. E., has evidently labored with tireless energy in the group embracing machines and apparatus used in sewing and clothing, and his notices of the American inventions are at once just and enthusiastic. He speaks in the highest terms of the following sewing machines: Wheeler & Wilson, Singer, Willcox & Gibbs, Weed, Howe, Wilson, and Grover & Baker. The friction belt gearing for obtaining varying speeds on sewing machines, exhibited by Mr. Howard, of this city; hide sewing machine, by Mr. G. C. Walters, of Philadelphia, and a similar machine by Mr. G. W. Baker, of Wilmington, Delaware, as well as Eickemeyer's hat blocking machine, exhibited by Eickemeyer's hat blocking machine company, of New York, receive special attention. Mr. Paget next refers to the American Button-hole Machine, of this city, as follows: The button-hole machine of the American Button-hole Overseaming and Sewing Machine Company employs a straight needle actuated through a vibrating arm and cam-grooved hub, and a curved shuttle reciprocated in a plane parallel with the feed on a curved raceway. For button-hole stitching the shuttle-race is turned aside, a vibrating arm provided with a curved thread-carrying looper is turned into working position so as to carry its thread through the loop of needled thread, and above the edge of the material to be acted upon by a loop spreader.

Honorable mention is next made of the Remington and Hamburg-American sewing machines and their fellow competitors to the exhibits of Billings & Spencer Company, Connecticut; National Needle Company, Springfield Mass.; the Lamb Knitting Machine Company; Franz & Pope Knitting Machine Company; Mr. Dana Beckford's (New York) automatic reversible machine; Campbell & Clute's upright rotary knitting machine. In cloth-cutting machines, favorable notices are made of the manufacturers of Mr. Albin Worth, Staten Island; Mr. Storrs, Canton, N. Y.; and Mr. W. B. Walker, Boston, Mass. Mr. Paget reports briefly upon a miscellaneous class of machinery, including that of the Butler Braiding Company, Clinton, Mass.; the Pyramid Pin Company, New Haven, Connecticut. Mr. Oppenheimer's method of curling hair goods, and a novel "darning machine" made by the Pope Manufacturing Company, Massachusetts. The following well-known gentlemen were the colleagues of Mr. Paget in his duties as one of the judges in this group: Edward H. Knight, A. M., late of the Patent Office, Washington, president; Frederick A. Paget, C. E., secretary, Great Britain; George W. Gregory, Boston, Massachusetts; L. D. F. Poore, Springfield, Dakota.

AMERICAN ENGINEERING.

"Architecture and Engineering as displayed at the International Exhibition" is the subject of an able paper by Sir John Hawkshaw C. E., F. R. S., who was associated, during his sojourn in this country, with the following gentlemen appointed as judges for this group: General William B. Franklin, president, Hartford, Conn.; Edouard Lavoine, secretary, France; J. M. Da Silva Continho, Brazil; James B. Eads, C. E., South Pass Jetty Works, 122 Common street, New Orleans, La.; T. G. W. Fynje, Netherlands; Richard M. Hunt, 49 West thirty-fifth street, New York; Lourenco Maheiro, M. E., Portugal; Colonel George E. Waring, Jr., New York, R. I.

Sir John Hawkshaw gives an interesting account of the engineering feats at Hallett's Point (Hell Gate), a recapitulation of which will not now be necessary, and adds a full description of the United States steam-drilling crew used in removing reefs and rocks under water. The engineering works in the Mississippi, the dredging of channels, erection of jetties, the construction of the harbor on Lake Huron, where the breakwater will be 7,000 feet long, and will inclose an area of 320 acres of 12 feet of water, and the great light-houses of the coast are all dwelt upon in detail; and the gentleman then refers in terms of admiration to some of our American bridges. Those mentioned include the Niagara Suspension Bridge, 800 feet in span; the Brooklyn bridge, the whole length of which will be 3,455 feet; the St. Louis steel-arched bridge—a work which he regards as "very remarkable for boldness of design and for originality in construction;" the iron truss bridge at Cincinnati, the Washington aqueduct, and the Girard avenue bridge, Philadelphia, which he calls "a fine structure, equal in size to the largest bridge across the Thames." The following lines from this very complimentary paper will be read with interest:

From the magnitude and number of the public works in the United States, however, other lessons may be learned than those which tell only of the science and skill of its engineers. From what I have seen, they possess enough of both to fit them for the accomplishment of any work they are likely to undertake.

The 70,000 miles of railway already constructed; the ramification of the electric telegraph, and its application to uses more extended and varied than in our own country; the crowd of steamboats wherever navigation is possible and public convenience can be promoted; the building of cities like Chicago, which, after the great

fire, in four or five years has arisen out of its ashes a more beautiful city than before—all these tell of the increase of wealth, and speak still more strongly of the public and patriotic spirit of the people.

To me, who visited the United States on former occasion, but so long ago that Chicago was then but a village, and Philadelphia had not more than one-half its present population, when its railways were only beginning to be made with wooden bridges and almost temporary works, when its vast mineral wealth was nearly untouched, and wood was burned where coal is now consumed, the astonishing changes, and the vast progress since made, appear greater than perhaps they will do to others whose visits have been more frequent. However this may be, I witnessed at the Exhibition at Philadelphia, and in the districts I visited, impressed me very strongly with the energy of the people and the vast resources of this great country.

USE OF NICKEL PLATE.

Mr. James Bain, says: I think our manufacturers should specially interest themselves in the action taken by the Americans in the use of nickel. The ironmongery of a building—door knobs, hinges, and such like—which with us is mostly of brass or iron, is by them usually coated with nickel, and the result is a lightness and brightness, and a freedom from oxidation that our fittings do not possess. Their stove fronts, door plates, and other articles which we usually make of polished iron or steel, are coated with nickel by them, and varnished over with a solution of shellac in methylated spirits, which preserves the articles from oxidation and enables them to be kept clean and bright with little trouble.

LOCKS.

Upon the subject of locks Mr. Bain says: Since the days of Hobbs, who picked the famous Bramah lock, the manufacture of locks has often been observed and commented on. It is a very important branch of industry, and the extent of machinery employed and the number of firms engaged in the trade are very great. While locks of a kind similar to those made in Great Britain are plentifully manufactured in America, there are specialties as a rule only to be found in that country. Among these are the combination and chronometric locks, and these two sorts, if thought advisable, can be combined. The usual form of a combination lock is one having on it certain letters or numbers arranged in concentric movable rings. Suppose all the letters of the alphabet are upon these rings, and I resolve to lock the padlock with the letters A L O in a line; I do so, and thereafter I shift and mix the letters. No key will open the lock until the letters are again placed in the same line, and as the combination is known only to myself, additional security is obtained by the device.

Some of these locks have as many as 2000 combinations. It has been said "necessity is the mother of invention," and so it has been with the chronometric lock. It is an expensive lock, varying in price from £50 to £250. It is used for banks and safes where money and valuables are kept; and the need for the invention arose in this way. The thief-proof safes in the United States are, I believe, admitted to be superior in quality to those manufactured in Europe; and when burglars effected an entrance into a bank they found they could not drill the safe in the time at their disposal, so they adopted a different mode of robbery. The gang effected an entrance into the bank and seized and gagged the whole household. They then presented a pistol to the head of the manager and demanded the keys of the safe, and as generally a man will do anything to save his life, they got the keys, plundered the safe, locked it again and made off, leaving the family gagged. Many burglaries of this kind have occurred in the United States. To prevent such a case happening, the chronometric lock has been invented. It is a mixture of a lock and timepiece, and may also be a combination lock, such as I have described. Suppose the hour of closing the bank is 5 o'clock in the afternoon, and 10 o'clock next morning for opening it, the manager when he goes to close the safe sets the clockwork of the lock to 10 o'clock next morning, and then locks the door of the safe; that done, it is impossible for any one to unlock the door till next day; the key is of no use; but next day at 10 o'clock, the usual hour of opening the bank, the chronometric arrangement in the lock drops a bolt and permits the key to turn in the lock and the door to be opened. There are many kinds of locks in America, mostly made by machinery, and at prices from 2d. to £200 each. The quality and accuracy of the workmanship, and the great demand that exists for American locks in foreign countries, are well worthy of consideration by the manufacturers of locks in Great Britain. Among the locks exhibited by other countries, those from Norway deserve honorable mention; they are made by hand, the mechanism is exact, of excellent finish, and the price very moderate.

Looking to the variety and character of the United States exhibits of building and household ironmongery, including locks, it may be said it is more than creditable, in beauty of design, tasteful finish and adaptability to the end in view, and that the manufacturers of such articles in Great Britain may acquire from them lessons to enable them to compete with the manufacturers of the United States in other countries.

CONCLUSION.

Peter Graham, Esq.'s, report on industrial and architectural design, &c., and the paper on electric and telegraphic apparatus, by Sir William Thompson, L. L. D., D. C. L., F. R. S., are both very brief, and of a general nature. The volume in which the papers are printed contains 332 octavo pages, clearly printed, indexed, copiously supplied with convenient side notes, and handsomely illustrated with large, finely engraved plates of all Centennial buildings. The foregoing extracts will serve to show how thoroughly American achievements are appreciated; how frankly American superiority in certain directions is acknowledged, and how lightly the points of inferiority, when such exist, are dwelt upon by our English cousins. The publication of such a work in England cannot but prove of inestimable benefit to American manufacturers, and to those who regret that it is now

too late to add their support to the Centennial enterprise, to which we owe this international recognition, we have only to say, devote your time, your means, and your influence to the aid of its prototype, the Permanent International Exhibition, and the results will be even more satisfying than were the triumphs of its brilliant but short-lived predecessor.

INDUSTRIAL ITEMS.

CONNECTICUT.

The Sharps Rifle Company are sending samples of their new rifle for military use to China, and will probably receive a large order from that country. Business continues at this establishment.

The East Canaan furnaces have been treated to a bit of "unfortunate luck" the past four months of summer. Early in the season the low water refused to turn their wheels, and of course the blowers ceased to breath upon the fires with sufficient strength to melt the ores, and a stationary engine was substituted, when all went well till Sunday, the 12th inst., when the shaft to the balance wheel of the engine broke, and as it could not be repaired in time to save the blast, the workmen were compelled to blow out one of the furnaces.

NEW HAMPSHIRE.

S. C. French & Co., of Manchester, general machinists and manufacturers, report business improving in their line. Among their recent shipments are the following: a milling machine and drop press to the Studebaker Manfg. Co., South Bend, Ind.; a large iron planer to J. P. Merriam, Sandusky, Ohio; besides a yacht engine and boiler, an 8-foot engine lathe, and portable engine to other parties. Six 10-foot bed engine lathes and one 8-foot lathe have been shipped to various parties recently, besides a boiler, steam engines, turbines, and wood-working machinery. The firm have just sent out 1400 pounds of 8-inch water pipe to the Oscoda Salt & Lumber Co., Oscoda, Mich.; besides building a fine engine and hose carriage for Durham, Mass. Their orders on their books at the present time are pretty well distributed throughout the country. They are fitting up the shafting and pulleys for the *Herald* building in Boston.

MASSACHUSETTS.

The Hopkins Watch Tool Company, of

work for the United States government. They are also employed on orders for machine tools, &c., of which they build every variety.

The Wilmington Plate Iron Mills (Seidel, Hastings & Co.) report a fair demand for plate iron, but in common with others complain that prices are unremunerative. They employ about 100 hands.

A. L. Henderer & Co., machinists, report a fair demand for mill work, carriage and wheelmakers' tools, &c. They are also quite busy on repairs of various kinds, with prospects indicating a steady and increasing trade.

Remington & Co. have just completed a large order for paper mill machinery, and report general business quite satisfactory.

PENNSYLVANIA.

The Pennsylvania and New York Canal and Railroad Company have just put in one of Ramsey's car truck shifting apparatus at Waverly, N. Y. At a trial made a few days ago under rather unfavorable circumstances, the machinery being unfinished, a box car was run a distance of 200 feet, and the trucks changed in 2 minutes and 15 seconds. It is believed that with a longer pit and an increased number of side trucks, the time can be reduced to 1 minute per car, with no other motive power than gravity, and without the use of skilled labor.

The Eureka Cast Steel Company, Chester, organized some months ago, have recently commenced active operations in most convenient and extensive premises, erected specially for the purpose. They make castings of the smallest size, up to 10 tons in weight, and suitable for all purposes. W. H. Reaney is president; W. H. Dickson, secretary, and Frederick K. Baldt, manager.

The Baldwin Locomotive Works have recently received orders for 10 locomotives to be built in their own shops at Susquehanna, five for the Missouri, Kansas and Texas railroads, five for the Pacific Coast, four for the Atlanta and Charlotte Railway of Georgia, and two for the Greenville and Columbia Railroad of South Carolina.

The Erie Railway Company have given orders for the construction of 16 "Consolidation" locomotives. Six are to be built in their own shops at Paterson, N. J., and five for the Pacific Coast, four for the Atlanta and Charlotte Railway of Georgia, and two for the Greenville and Columbia Railroad of South Carolina.

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Paxton Furnace, at Harrisburg, which had stopped for a week, is again in full

Mr. B. F. Morret, lessee of the Union Forge, Lebanon county, is working the forge with a full set of hands on full time, turning out a large quantity of iron, with plenty of orders on hand.

At Westerman's, Sharon, the puddle mill went in on Monday of last week, after a stoppage of two weeks. The chain factory went in, after stop since June 25, under the management of David Thomas, the boss blacksmith. There are only six fires on now, but we understand that more will go on soon. A new cast house, 75x45 feet, is being built for No. 1 Westerman Furnace.

Messrs. Stupp & Neff, of Womelsdorf, have reopened an ore mine along the South Mountain, which had been abandoned for many years on account of sufficient ore not being found to pay the expense of taking it out. Recently a new shaft was opened, which produces an enormous yield of the best iron ore. The firm contemplates working the mine to its full capacity.

The smoothing iron factory at Atglen was destroyed by fire a few days ago. Loss about \$2000—no insurance.

Paper wheels are now being tested under one of the heaviest locomotives running over the Philadelphia, Wilmington and Baltimore Railroad. They have been running now for some weeks, and have thus far proved highly satisfactory.

Efforts are being made with a prospect of success to re-organize the defunct Lancaster Watch Company.

At Coatesville, the rolling mills are running on small orders. The large viaduct mills have been standing idle for the last two years, with the machinery rusting, and there is no prospect of it resuming in the near future. There are between fifty and one hundred houses in and around the borough standing idle in consequence of the mills not employing more men.

Huntingdon expects to raise \$100,000 subscriptions to start experimental glass works capable of manufacturing 500 feet of polished plate glass per day. A committee of thirteen persons solicit additional subscriptions to the \$50,000 already raised.

Over one hundred car loads of iron have been received in the Altoona shops from the ruins of the recent riots. The railroad company is having it all weighed and piled up for future disposition.

The rolling mill at Greenville, Mercer county, was sold at Sheriff's sale recently for \$15,450. Mr. Benninghoff was the purchaser.

PITTSBURGH AND VICINITY.

The situation at Jones & Laughlins is unchanged. The laborers who are the only ones on a strike still hold out, and on Saturday pasted a notice warning all parties to keep away.

The following coal mines on the Pan Handle are in operation: National Coal, Oak Ridge, Cherry Mines, Huntsman & Miller's, Fort Pitt, Steen & Son's works, Mansfield. On the Chartiers Valley: Summer Hill Company, Nixon Coal Mines, McAbey & Clark Mines, Bridgeville Mines.

The coopers of Pittsburgh are on a strike for an advance from 14 to 16 cents a barrel. The strikers number between three and four hundred.

One of the glass houses of the Tibby Brothers, near Sharpsburg, has shut down for repairs.

The lamp chimney manufacturers of this city have been notified by the blowers that they will demand the same production for a day's work as they made before the introduction of the patent crimping machine. With the aid of this machine a blower is enabled to turn out fifty more chimneys a day. At Wheeling the lamp blowers at the South Wheeling Glass House finally went out on a refusal of the firm to advance them from \$1.20 to \$1.50 per move. Both sides seem disposed to hold out, the men remaining there to keep the firm from putting other hands in their places. The works have secured a supply of lamp goods to meet their trade.

Shoenberger & Co., are running full, all but sheet mill.

But one Isabella furnace is in blast. Chess, Smyth & Co. are running full.

W. D. Wood & Co. are running full.

MacIntosh, Hemphill & Co. are busy. They are building a new furnace for the Hocking Valley region.

Wilson, Walker & Co. are running full single turn.

Lewis Oliver & Phillips, have bought 1000 tons of scrap iron from the Pennsylvania Railroad, part of the ruins of the fire. They bid for the whole pile.

The Pittsburgh Manufacturing Company is engaged on incoming orders for agricultural tools and other similar products. They recently received an order from one Southern house for 60 tons of their manufactures.

Zug & Co. are running their nail mill full, the nail plate rolls double turn. In the merchant mill the puddlers work four days in the week.

Wm. Clark & Co. are running full single turn.

No. 1 Shoeburgh Furnace is in blast; No. 2, still idle.

Both the Lucy furnaces are still out of blast.

Brown & Co. are running full, in both iron and steel departments.

WEST VIRGINIA.

The Riverside Iron Mill, at Wheeling, is running full in all departments, and it is probable the others will start on or before the first of next month.

Work has begun on the new Pittsburgh, Wheeling and Kentucky Railroad.

OHIO.

The firm of Roebeling's Sons, Trenton, N. J., manufacturers of wire rope, have just given Turner, Parks & Co., of Cuyahoga Falls, an order for eight fine wire frames.

Belfont Furnace, after a long period of quiet, was to blow in last Monday. The Belfont Company used up their metal very close, and they will have to make some more before the nail factory starts up.

Both of the Leetonia furnaces are in blast, but the puddling department of the mill has been stopped for nine weeks. The 8-inch mill will start this week. One furnace is running in Grafton, and they will start the other now that the strike is over. The coal miners are on half time.

The Portsmouth Foundry and Machine Works are at work on four 40-ton boilers, 50 feet long, for the new Winona, Logan county, Furnace.

Brown, Bonnell & Co.'s mills have been supplied with two additional boilers that were manufactured by themselves and put in position. Heretofore the works have been run with a battery of eight boilers; now they have ten.

The Hogen Elbow Company, Cleveland, has increased its capacity, and will turn out elbows hereafter at the rate of 75 dozen per diem. The elbows take splendidly in the market, and the firm is behind with its orders.

The Union Foundry Company, Cleveland, is very busy manufacturing small castings. J. H. Lapham has been engaged in the manufacture of zinc washboards in Cleveland for only about two weeks, and is preparing to make and dispose of the boards at 100 dozen per day. The washboards are of the Imperial, Eagle, Star and Commercial brands.

TENNESSEE.

The Southern States Coal, Iron and Land Company (Limited) has held its half-yearly meeting at Stockton-on-Tees, Mr. Thomas Whitwell in the chair. The works and premises of the company are situated in Tennessee. The report of the directors showed a net profit of £1614. 3/6 to the end of last year, exclusive of £3674 profit arising from the sale of gold at a higher premium than that now current. The company's colliery is expected to be at work by August. One furnace will be completed this year, and another being commenced. The directors have arranged with Mr. James Brown, Jr., the present secretary, to go out to Tennessee as assistant general manager, his father being the general manager.

IOWA.

Burlington appears to be resolved upon having a rolling mill and nail manufactory. The citizens of the place are holding meetings in favor of the project, and the \$40,000 necessary has been subscribed. The mill will be moved from Cleveland, Ohio.

INDIANA.

The New Albany rolling mills are running full blast, and are shipping vast quantities of manufactured iron.

During the past week the Ohio Falls Iron Works, at New Albany, have shipped 314,276 pounds of iron.

Things are brisk in Jeffersonville now. The ship yards are lively, the glass works are at it red hot, and the car works have gone to work in earnest.

The Ohio Falls Car Company, Jeffersonville, has received a good paying contract in the shape of 500 car-wheels for a Southern road. The car company is now employing about 450 men, and its immense departments are running in full blast.

ALABAMA.

The Eureka Iron Works are increasing in magnitude.

The Polytechnic College of Pennsylvania, located in Philadelphia, has determined to establish a preliminary course of a year. The qualifications for admissions to this course will be those required of teachers in the common schools of the State. It is hoped this new departure may strengthen this institution, where so many of our prominent engineers and metallurgists have graduated, and that the department may fill the gap so long existing between our grammar and high schools and the technical institutions of the country.

Special Notices.

Just Issued.

THE METALLURGICAL REVIEW.

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PROSPECTUS.

It is evident to all who are well informed as to the state of the metallurgical industries of the world, that we have fairly entered upon an era of exceptionally rapid scientific progress, in which the old methods of manufacture will be superseded by new and more economical processes. The "New Metallurgy" demands a current literature of its own. Newspapers cannot give space to the calm discussion of matters of purely scientific interest; books can, at most, follow progress at a distance. The "Metallurgical Review" is intended to be a record of current progress, which shall combine the entire range of information in the convenience and permanent value of a book. Its interest is both scientific and practical, and its conductors will spare no pains to secure valuable original contributions from writers of known ability and recognized scientific standing, American and foreign.

The field of The Metallurgical Review includes what is new and important which possesses historical or practical interest relating to the metallurgy of the useful metals, from the mining of the ores to the final processes which make the metals available as materials in the arts. Matters of scientific interest indirectly connected with these subjects will also be considered when of importance to the student or the original investigator.

Each volume will be divided into parts, each containing a general index of titles and a topical index to aid the student in searching for facts and references.

It is intended that a set of volumes shall be a valuable library of metallurgical literature, and nothing will be omitted which can in any way contribute to the convenience of the reader.

AUGUST LIST.

MACHINE TOOLS,

Second-Hand and New.

SECOND-HAND TOOLS.

One Wright's Patent Cut-off Steam Engine, 14 in. cylinder, 32 in. stroke.

Two Engine Lathes, 29 in. swing, 8 ft. bed. N. Y.

S. E. C. 18 in. swing, 8 ft. bed.

One Engine Lathe, 22 in. swing, 8 ft. bed. N. Y.

E. C. 18 in. swing, 8 ft. bed.

One Engine Lathe, 26 in. swing, 36 ft. bed. N. Y.

E. C. 18 in. swing, 36 ft. bed.

One Engine Lathe, 26 in. swing, 36 ft. bed. N. Y.

E. C. 18 in. swing, 36 ft. bed.

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One Engine Lathe, 26 in. swing, 36 ft. bed. N. Y.

E. C. 18 in. swing, 36 ft. bed.

Trade Report.

Office of THE IRON AGE.

WEDNESDAY EVENING, AUG. 29, 1877.

The position in Wall street has been strong for the most part during the past week, though there was a slight reaction to-day owing to financial troubles in Chicago which were expected to extend and possibly precipitate some of the Western securities held there upon this market. The failure of the State Savings Institution, at Chicago, was the primary cause of the excitement which was allayed, in part, by later telegrams, announcing no further suspensions and a more confident feeling.

The money market has been firm, with call loans mostly executed at 4 @ 5 per cent., though 3 1/2 per cent. has been made in some instances.

Gold has touched a pretty low point during the week, as will be seen by the rates printed below. There is, however, a slight reaction toward the close, but with the market weak this afternoon. The following table shows the daily range of the premium:

Highest.	Lowest.
Thursday	104 1/2
Friday	104 1/2
Saturday	104 1/2
Monday	104
Tuesday	104 1/2
Wednesday	104 1/2

Government bonds have varied but slightly during the week, but are a fraction lower at the close. The demand has been good. We give the closing quotations for all issues below.

The stock market has been settling a little this week, though the "bull" interest has maintained its position very well, and but little of the late advance has been lost. As noted above, the Western railroad shares received a blow to-day, but they are not much depressed at the close. We give below the closing quotations for active shares.

FOREIGN IMPORTS.

For week ended Aug. 25 :

	1875.	1876.	1877.
Total for week.	\$7,572,013	\$4,724,681	\$5,559,038
Prev. reported.	28,135,000	29,694,812	25,794,359

Since Jan. 1 \$23,707,013 \$195,418,893 \$23,348,417

Among the imports of general merchandise were articles valued as follows :

Quantity.	Value.
Brass goods	\$6,989
Bronzes	4,673
Chains and Anchors	1,055
Cutlery	1
Gas fixtures	53,046
Guns	9,421
Hardware	1,334
Iron, pig, tons	2,844
Iron, sheet, tons	2,45
Iron tubes	359
Iron, wire, tons	150
Iron ore, tons	1,313
Lead, pigs	30,266
Metal goods	20,046
Needles	26
Nickel	11,829
Platina	985
Per. caps	4,471
Saddlery	1,165
Saddles	723
Splelter	55,171
Tin, bxs.	33,784
Tin, 45 slabs	118,790
Wire	1,301
Zinc	85,325

EXPORTS, EXCLUSIVE OF SPECIE.

For week ended Aug. 28 :

	1875.	1876.	1877.
For the week.	\$4,146,312	\$5,540,558	\$4,267,376
Prev. reported.	163,333,144	160,774,324	177,616,043

Since Jan. 1 \$167,379,456 \$175,312,882 \$182,483,319

EXPORTS OF SPECIE.

For week ended Aug. 25 :

	\$94,060
Previously reported.	21,853,461

Total since Jan. 1, 1877 \$21,947,521

Same time in 1876 39,930,328

Same time in 1875 63,677,355

Same time in 1874 40,244,927

Same time in 1873 39,244,950

Same time in 1872 36,164,611

Government bonds at the close were quoted as follows :

Bid.	Asked.
U. S. Currency 6's	123 1/2
U. S. 6's 1881 registered	110 1/2
U. S. 6's 1881 coupon	111 1/2
U. S. 6's 1881 reg	106
U. S. 6's 1866 cou	108 1/2
U. S. 6's 1867 reg	108 1/2
U. S. 6's 1868 cou	108 1/2
U. S. 6's 1868 reg	108 1/2
U. S. 10-40 reg	108 1/2
U. S. 10-40 coupons	108 1/2
U. S. 58 1881 registered	108 1/2
U. S. 58 1881 registered	107
U. S. 4 1/2 1891 registered	108
U. S. 4 1/2 1891 coupon	108 1/2
U. S. 4 1/2 1891 registered	104 1/2
U. S. 4 1/2 1891 registered	104 1/2

The following were the closing quotations of active shares :

Bid. Asked.

Atlantic and Pacific Telegraph 19 —

Chicago and Northwest 31 1/2 31 1/2

Chicago, Rock Island and Pacific 60 1/2 60 1/2

Chicago, Bur. and Quincy 100

Col. Chic. and Ind. Cent. 99 3/4 3 1/2

Clev., Col., Cin. and Ind. 31 1/2 32

Cleveland and Pittsburgh 81 1/2 82

Chicago and Alton 87 87 1/2

" Pref. 101 101 1/2

Combination and Co. 50

Delaware, Lack. and Western 48 1/2

Delaware and Hudson 49 49 1/2

Express—Adams 93 93 1/2

" American 46 47

" United States 43 43 1/2

" Wells, Fargo & Co 83 83 1/2

Brie 11 1/2 11 1/2

Hannibal and St. Joseph 143 143

" Pref. 142 142

Illinoian Central 25 1/2 25 1/2

Kansas Pacific 1 1/2 1 1/2

Kansas and Texas 4 1/2 4 1/2

Lake Shore 62 63

Michigan Central 56 56 1/2

Morris and Essex 74 1/2 75 1/2

Milwaukee and St. Paul 20 20 1/2

" Pref. 65 65

New York Central 101 1/2 101 1/2

New Jersey Central 17 17 1/2

" Southern 3 1/2 3 1/2

Ohio and Mississippi 6 6 1/2

Pacific Mail 10 10

Panama 24 24

Pittsburgh and Fort Wayne 11 1/2 11 1/2

Quickaliver 16 17 1/2

" Pref. 31 32

St. Louis and Iron Mountain 7 7 1/2

" " 24 24

St. Louis, Kansas City Northern 4 1/2 4 1/2

" " 24 24

Toledo, Wabash and Western 11 1/2 11 1/2

Union Pacific 68 69

Western Union Telegraph 81 1/2 81 1/2

MINING STOCKS.

Mr. Ogden Haight, No. 65 Wall street, sends us the following report of the business of the New York Mining Stock Exchange for the week ending Aug. 29 :

Closing Quotations. Shares Sold.

Alpha	13.00	400
American Flag07	100
Belcher	6.00	300
Beth. & Edith	1.25	17,800
Boatil	18.75	100
Boatil Tunnel	3.50	200
Bullion	8.50	400
Caledonia	4.12 1/2	400
California	32.12 1/2	200
Chollar Potosi	38.50	300
Consolidated Industrial	1.12 1/2	2,100
Consolidated Virginia	34.00	300
Confidence	2.25	900
Crown Point	4.37 1/2	4,75
Eureka	45.12 1/2	300
Exchequer	7.12 1/2	350
Gould & Curry	9.87 1/2	520
Hock	5.50	320
Holiday	2.50	400
Julia Consolidated	1.37 1/2	200
Justice	11.75	400
Kentuck	6.00	1000
Lacrosse33	3,700
Leopard	2.50	2,100
Merrimac	5.12 1/2	100
Mexican	10.75	1,500
New York & Colorado	5.37 1/2	3,725
Northern Belle	10.00	300
Ontario	21.75	2,000
Ophir	18.75	760
Overman	28.37 1/2	330
Quicksilver Preferred	16.62 1/2	1,250
Randall & Ely	19.00	1,900
Seaside	8.00	900
Segregated Belcher	43.50	100
Sierra Nevada	5.00	80
Silver Hill	2.75	120
Union Consolidated	5.75	300
Union Consolidated of Tenn	15.50	11,500
Yellow Jacket	11.00	325

Business is duller in this exchange. The transactions during the past week have not amounted to over 60,000 shares. We attribute this to the heat and to other causes.

Moose is still active, with sales of 13,725 shares, and is rising in price, 5 1/2 being bid.

Bertha and Edith is active, but the price remains the same. Lacrosse is quiet, selling down to 33c. Boatil is strong, but quiet.

We hear of outside purchases of several thousand shares of American Flag for investment.

A dividend of \$1.50 per share has been declared on Justice. Two thousand shares Ontario were sold during the week in the regular board. The following rates of commission have been adopted : Stocks selling at \$1 per share and under, commission of \$1 per 100 shares ; stocks selling at \$1 to \$2 per share, commission of \$2 per 100 shares ; stocks selling at \$2 to \$10 per share, commission of \$3 per 100 shares ; stocks selling at \$10 to \$25 per share, commission of \$6.25 per 100 shares ; stocks selling at \$25 to \$50 per share, commission of \$12.50 per 100 shares ; stocks selling over \$50 per share, commission of \$25 per 100 shares.

GENERAL HARDWARE.

Trade continues fairly active, with perhaps fewer buyers in the city than was the case a week ago. Travelers, we are informed, are doing well, and mail orders are numerous and satisfactory for the season. The same demoralization which we have already noticed in the prices of various lines of goods continues, and its effects are being seriously felt in the general distrust which such conditions occasion. Foreign Hardware is in fair demand, and the market is firm in its tone.

There is very little to be said regarding the Nail market ; the demand continues light, and the new card of rates mentioned last week is, we are informed, strictly adhered to. We quote rod, \$2.50, net, with an allowance of 10 cents per keg for lots of 200 kegs and over.

We have received the following joint circular, which explains itself :

IMPORTS

Of Hardware, Iron, Steel and Metals into the Port of New York, for the Week ending Aug. 28, 1877:

Hardware.	
Carey & Moen,	Bundles, 331
Wads, cts., 3	Bars, 2
For W. B. & Bro.	Prosser Thos. & Sons,
Cases, 21	Tin forgings, 18
Folsom H. & D.	Bars, 40
Mds., pkgs., 6	Cans, 2
Hiedman & Lauter-	Rochester Screw Co.
jung,	Bundles, 18
Mds., pkgs., 3	Saxton & Seabury,
Fuller Bros.	Cases, 22
Cow Ties, cks., 5	Bars, 3
King, Briggs & Co.	Scott Thomas,
Wads, cts., 2	Bundles, 120
McCoy & Co.	Ward W. O.
Mds., pkgs., 5	Cases, 3
Witte John G. & Bros.	Bars, 22
Cutlery, cr., 10	Order,
Needles, 1	Casks, 30
Woodruff A. T. & Co.	Cases, 6
Cases, 5	Metals.
Wieland & Hilger Hdw.	Bear J. & Sons,
Cutlery and Hdw.,	Tin plates, bxs., 260
pkgs., 10	Bruce & Cook,
Order,	Tin plates, bxs., 260
Packages, 19	Byrne Jos. & Co.
Iron.	Tin, ingots, 800
Dennison, Thos.	Dickerson Van Dusen &
Scrap, bbls., 7	Co.
Henderson Bros.	Sheets, zinc, cks., 40
Pig, tons, 50	Tin plates, bxs., 357
Marvel W. D.	Tin, ingots, 345
Ore, tons, 300	Scrap lead, bbls., 2
Mitander Nils,	Scrap brass, bbls., 1
Bars, 400	Scrap cop'r., bbls., 2
Nail rods, bbls., 2344	Scrap cop'r., pos., 2
Naylor Co.	Hendrick Bros.,
Bars, 6311	Lad., pipe, 260
Bundles, 226	Jex William & Co.
Phelps, Dodge & Co.	Scrap copper, cks., 3
Shad. bbls., 191	Naylor & Co.
Sampson Clef G.	Tin plates, bxs., 1930
Pig tons, 200	Phelps, Dodge & Co.
Wheeler E. S. & Co.	Tin plates, bxs., 5205
Bundles, 38	Bills, pds., bxs., 16
Bars, 598	Schneider Jos. & Co.
Order,	Tin plates, bxs., 48
Spiegel, tons, 483	Schmidt O. E.
Bundles, 240	Lead, pigs, 2300
Steel.	Wheeler E. S. & Co.
Brown Wm. & Co.	Lead, pigs, 735
Cases, 18	Order,
Bundles, 141	Tin plates, bxs., 4300
The prices current for Rags, &c., are as follows:	Lead, pigs, 3062
Cotton, Linen.	Without Bill of Lading,
" Cotton, No. 1.	Tin slabs, 620
" Cotton, No. 2.	
White, No. 1.	
" No. 2.	
Colored do.	
Mixed Woolen.	
Sofa do.	
Gunny Bagging.	
Jute Butts.	
Kentucky Bagging.	
Book Stock.	
Newspaper Stock.	
Waste Paper and Scraps.	
Kentucky Bale Rope.	
Cakununk, No. 1.	
" NC. 2.	
Tarred Shaking.	
Grass Rope.	

PHILADELPHIA.

Office of *The Iron Age*, 220 South Fourth St., Philadelphia, August 28, 1877.

The past few days have developed an improved feeling in general business circles, and a more than usually large fall trade is looked for. In many departments of trade there is considerable activity, and with a firm tone to the prices of nearly all the leading staples, it is felt that the improvement is likely to be permanent. Advices from the West and South, and, in fact, from all the agricultural districts, continue to be of the most favorable character, and with the certainty of a large foreign demand for our food products, confidence is rapidly taking the place of doubt and despondency. The Iron trade is not perceptibly affected, nor is it likely that any important change will be inaugurated for some time to come. There is a stronger feeling, however, and sellers are not willing to concede anything from regular quotations, while in some instances a slight advance has been asked. This in the iron trade is an entirely new departure, and would scarcely have been ventured upon in the usual course of business. The change is so great, however, that buyers have begun to call upon sellers to ask for quotations, &c., in consequence of which they (the sellers) are beginning to show a very bold front. There is nothing at present to warrant the expectation of any important advance, but it is quite likely that the Iron trade, in all its departments, has touched bottom, and although the recovery may be slow it will be none the less certain.

Pig Iron.—The market shows no essential change of feature, prices are steady, and the demand in some directions rather more active. Taking all the circumstances into consideration, it is surprising to note the indifference which consumers manifest in regard to the future. It appears to be conceded by all parties that prices have reached their lowest point, while the advance in freight and fuel is materially increasing the cost of production. At this season, too, a larger demand is always expected, and as we said before, there is already in some quarters a more active movement, based upon actual consumptive requirements. Buyers are not in the least alarmed, however, and are as unwilling as ever to anticipate the future. Still the market is in better shape, and while it is impossible to obtain any advance in prices, the tendency is in that direction. There is less disposition to force sales, and transactions are not now so frequent at the lowest quotations, although round lots,

prompt cash and delivery, can still be secured at inside rates. We can also state that some special brands, which were offered a short time ago at concessions from regular rates, cannot be had now on the terms then named, although the parties to whom they were offered have since expressed their readiness to take the iron.

There is considerable inquiry for Iron from the pipe founders, one firm having just closed a contract for 5000 tons Cast Pipe for Baltimore, while others in the trade have also a fair amount of orders on hand. Inquiries from the mills are unusually light, as there is very little demand for finished Iron, and in many instances Old Rails are largely used. The demand for Foundry Iron is improving somewhat, and the general outlook seems to be rather more encouraging than for some time past. We quote the market steady at the following prices, with a disposition to hold for outside figures: No. 1 Foundry, \$18 to \$19; No. 2 Foundry, \$17 to \$17.50; Gray Forge, \$16 to \$16.50, with special brands held at \$1 to \$1.50 per ton more.

Plate and Tank Iron.—There is no change in price or demand, but the mills are kept fairly employed. Orders are not large, but numerous enough to keep prices steady. There is some disposition to buy more freely at lower prices, but manufacturers are not disposed to make concessions, as the margin is small enough already. It is quite probable that the demand will increase shortly, as there is a fair prospect of a general improvement in business, and if certain projects now under consideration are carried into effect, Plate Iron will be required in large quantities. We quote as follows: Ship Plates, 2.37 1/2 c. to 2.50 c.; Tank Iron, 2 1/2 c. to 2 1/2 c.; Shell Iron, 3 c.; Flange Iron, 4 c. to 4 1/2 c., and Best Bloom, 5 1/2 c. to 6 c.

Sheet Iron.—The demand keeps up well, and although the season is late in opening, it is expected a full average business will be done. Prices are steady, and it seems as though bottom had been reached, as there is no disposition to make concessions unless for exceptionally large lots. We quote: Refined Sheet Iron, No. 26 to 28, 3 1/2 c.; Best Bloom Sheets, No. 26 to 28, 5 1/2 c.; No. 22 to 24, 5 1/2 c.; No. 16 to 21, 3 1/2 c.; Common Red Plates, 5-16 to 18, 2 1/2 c. to 2 1/2 c.; Refined Plates or Blue Annealed, 5-16 to 18, 2 1/2 c.; American R. G., 5-16 to 18, 3 1/2 c.; Best Bloom, 5-16 to 18, 5 c.; Philadelphia Russia, 9 c.; Bloom Galvanized, list, 45 per cent.; Refined Galvanized, list, 55 per cent.

Metal.—The purchasing prices offered by dealers for Old Metals are as follows:

Copper.....	\$0.14 @ \$0.15 per lb.
Yellow Metal.....	.10 @ .11
Brass.....	.08 1/2 @ .09
Compo. metal, heavy.....	.12 @ .13
Lead, solid.....	.03 1/2 @ .04
Tea Lead.....	.03 1/2 @ .04
Zinc.....	.03 1/2 @ .04
Pewter, No. 1.....	.13 @ .14
Pewter, No. 2.....	.08 @ .09
Spelter.....	.05 1/2 @ .06
Wrought Iron.....	.18 1/2 @ .19 pr ton.
Light do.....	" " "
Steel, Plat.....	.09 @ .10
Machinery do.....	.12 1/2 @ .13
Burned Iron.....	.40 @ .42

The prices current for Rags, &c., are as follows:

Cotton, Linen.	4 1/2 @ 5 c.
" Cotton, No. 1.	2 1/2 @ 2 1/2 c.
" Cotton, No. 2.	2 1/2 @ 2 1/2 c.
White, No. 1.	4 1/2 @ 5 c.
" No. 2.	3 c. @ 3 c.
Colored do.	3 c. @ 3 c.
Mixed Woolen.	3 c. @ 3 c.
Sofa do.	3 c. @ 3 c.
Gunny Bagging.	3 c. @ 3 c.
Jute Butts.	2 1/2 c. @ 2 1/2 c.
Kentucky Bagging.	3 c. @ 3 c.
Book Stock.	2 1/2 c. @ 2 1/2 c.
Newspaper Stock.	2 1/2 c. @ 2 1/2 c.
Waste Paper and Scraps.	1 1/2 c. @ 1 1/2 c.
Kentucky Bale Rope.	4 c. @ 4 c.
Cakununk, No. 1.	4 1/2 c. @ 5 c.
" NC. 2.	3 c. @ 3 1/2 c.
Tarred Shaking.	1 c. @ 1 1/2 c.
Grass Rope.	3 c. @ 3 1/2 c.

OLD METALS, PAPER STOCK, &c.

There are still no signs of improvement in the Old Metal market. The demand for anything in that line is very light, and the prospect of lower rates deters many from buying. Rags and Paper Stock are dull and declining. An occasional large sale is effected, but this is an exception and not the rule, as buyers are holding off and cannot be induced to purchase any considerable quantity.

The purchasing prices offered by dealers for Old Metals are as follows:

Copper.....	\$0.14 @ \$0.15 per lb.
Yellow Metal.....	.10 @ .11
Brass.....	.08 1/2 @ .09
Compo. metal, heavy.....	.12 @ .13
Lead, solid.....	.03 1/2 @ .04
Tea Lead.....	.03 1/2 @ .04
Zinc.....	.03 1/2 @ .04
Pewter, No. 1.....	.13 @ .14
Pewter, No. 2.....	.08 @ .09
Spelter.....	.05 1/2 @ .06
Wrought Iron.....	.18 1/2 @ .19 pr ton.
Light do.....	" " "
Steel, Plat.....	.09 @ .10
Machinery do.....	.12 1/2 @ .13
Burned Iron.....	.40 @ .42

STEEL RAILS.—Business still continues dull and quiet, and for some time past there have been no sales of special importance. Cutting has been rather freely indulged in of late, until finally prices have been marked down nearly \$2 per ton, although at the decline there is a stronger feeling. Some of the mills have been making deliveries at distant points at prices ranging from \$47 to \$48, with freights supposed to be \$3 to \$5, netting \$43 to \$44 at mills. With prospects of a larger demand, and possibly some slight addition in cost of production, sellers are not disposed to make concessions from the reduced quotations. An informal meeting of the trade was held here last week, at which all the mills were represented, and although nothing definite was accomplished the usual "good feeling" prevailed. Judging from the improved condition of railway securities and the certainty of increased earnings, a larger demand for equipments and supplies seems to be assured. Some well-informed parties assert, however, that the capacity for production is in excess of the requirements of the home demand, and a foreign trade seems to be a necessity if all the mills are to find steady employment at remunerative prices. The Pennsylvania Steel Co., we understand, are about closing their books for the fiscal year. Their total product has been about 49,000 tons. The works were closed for repairs nearly all December, and entirely closed during July. The average output was therefore nearly 1100 tons per week. In the meantime, we quote the market quiet and firm, \$44 to \$45, cash, at mills.

IRON RAILS.—The outlook in the Iron Rail trade seems to improve somewhat, and two or three important contracts have been closed within the past few days. Sales reported are one lot of 2000 tons, one of 1400 tons, two of 400 tons each, and a few lots of 100 tons each. We have the exact quotations, but they cannot in good faith be made public, as they include freight to points of delivery, interest and various contingent items. Our late quotations, however, fairly represent the market, although in one transaction, the net cash price would not exceed \$32 at mills.

Old Rails.—The market is very quiet, and prices easy. Several sales are reported at \$19, and it is quite likely that figure could be shaded for a round lot. We quote \$19 to \$19.50, according to terms and quality.

P. S.—We are just advised of a sale at \$18.50, prompt cash.

Scrap Iron.—The demand is less active and prices are easier, although strictly first class selections still command outside rates. We quote Cast, \$15 to \$16.50; Wrought, \$22 to \$23.

Nails.—The demand is well sustained, and a much larger business has been done than for some months past, and, with reduced stocks, holders are unusually firm at \$2.50, with 10c. reduction to buyers of large lots.

Lead.—Business is exceedingly dull, and prices are nominally unchanged—say, 5c. for Domestic; 5 1/2 c. to 5 1/2 c. for Refined; and Foreign, 6 1/2 c. to 6 1/2 c. gold. Manufacture is in good demand, and shot is especially

active, with indications of a large trade during the season. We quote: Bar, 6 1/2 c.; Pipe, 8 1/2 c., and Sheet, 9c.; Shot—Drop, 8 1/2 c. to 9 1/2 c.; Buck, 9 1/2 c. to 10 1/2 c., all less 10 per cent. to the trade.

PITTSBURGH.

Office of *The Iron Age*, 77 Fourth Avenue, Pittsburgh, Aug. 27, 1877.

Pig Iron.—While there has been no perceptible improvement in business during the past week, a better and more hopeful feeling prevails. Commission men nearly all look for an increased demand early next month, and the indications are that their expectation will be realized. Notwithstanding the vexed question of labor remains unsettled, and the probability is that the cost of Coal will be slightly enhanced, as some of the operators have already acceded to the demands of the miners, the mills will be pretty generally started up within the next week or two, and as very few if any of them have any Pig, they will be obliged to buy.

However, as there is no prospect of any immediate advance, the probability is that consumers, almost without exception, will adhere closely to the hand-to-mouth policy, buy only as their immediate actual wants necessitate, and even if there should be a slight advance, it would be of short duration, as it would cause an increased production. There are a great many furnaces out of blast that would be started up if prices were to advance 50c. or \$1 per ton. Hence it is not expected, nor by many of the producers is it, in the present condition of affairs, desired, as the production, notwithstanding it is down lower probably than it has been at any time since the panic, is still too large for consumption. The cost of production has been reduced to the very lowest point. As already intimated, it is more likely to be increased than reduced, and until there is a largely increased consumption, no improvement in prices can reasonably be expected. Bituminous Coal Smelted Iron may be quoted as follows: No. 1 Foundry, \$22.50 to \$23, 4 months; No. 2 do., \$21.50 to \$22; Gray Forge, \$20 to \$21.50. Sale of 100 tons Gray Forge Neutral at \$20, 4 months; 100 do. Red-short, \$21.50. Hanging Rock Charcoal Iron has been almost entirely supplanted here by Anthracite and other cheaper Irons; hence there is little or no call for it. A small sale of Eastern Cold Blast (Charcoal) is reported at \$33, 4 months; Anthracite Gray Forge offering at \$18 to \$19, 4 months.

Manufactured Iron.</

and our government is making an effort to place France on the same favorable footing. **Copper.**—The fall in the British India market has had the effect of diminishing the demand for manufacture of Copper and yellow metal, and consequently tends to weaken the London market already affected by the unfavorable statistical position explained by us in our last review. There is little doing here, and prices are but feebly supported at the following quotations: Chili Bars, 182.50 francs the 100 kilos.; Common Bars, 172.50; Lead, 182.50; Zinc, 182.50; Selected English, 182.50; and pure Cowcoco Ore, 182.50. **Havre.** Is unaltered except as regards first brands Chili Bars, which are weaker and obtainable at 182.50. Paris conditions. Good current remain 182.50 to 182.50, and Lots and Urments, 172.50 to 182.50. Marseilles is depressed by the state of war in the East, and may remain so for an indefinite time. Some Egyptian copper is now worth sold at 182.50. They quote Red Tokat, 182.50 Small Refined Ingots, 172.50 to 182.50; Sheathing, 182.50 Bolts, 182.50, and Yellow Metal Sheathing 182.50. **Tin.**—The uncertainty as to the possible supply to come from Australia during the remainder of the year tends to check a recovery in values both in England and on the Continent. Nothing has transpired here. We quote Banca, 182.50 francs the 100 kilos.; Tin, 182.50; Sheet, 182.50. **Marseille.** Is remarkably quiet, and prices are as good as nominal; they quote Banca, 182.50; Straits, 172.50 to 182.50; Billiton, 182.50; and English, 182.50. **Lead.**—The tendency continues slightly downward. Here, at Paris, we note a decline. French, Belgian and German being at 182.50 francs the 100 kilos., and others at 182.50 francs. **Havre.** Is at 182.50. **Brussels.** Is nominally 182.50 to 182.50. No improvement at Marseilles, where, on the contrary, First Fusion now offers at 182.50 to 182.50, and Second ditto at 172.50; Sheet and Tube, 182.50; and Shot, 182.50. **Spelter.**—Great ease is still the characteristic of this metal, although prices are sustained at 182.50 francs the 100 kilos. for Silesian, deliverable at Havre, and others, brass, to be delivered next at 182.50. At Havre nothing transpires, the quotation remaining 182.50 to 182.50 for Silesian Marseilles unaltered; no sales reported. **Iron.**—Not much of a revival is as yet observable, but the works whose prices were raised of late have thus far succeeded in maintaining them where they are, and may find the Champagne district to follow their example. **Cast Iron.**—Hardware is in general request. In Paris, Haute-Maine, Cast Sheet, Iron of best quality sells at 182.50 to 182.50. For thin Sheet from a good many orders are dropping in the Meurthe and Moselle. Merchant Iron is worth 182.50 francs, but affiance Pig Iron is weaker, and as low as 182.50 has been offered for the same. In the Ardennes, Merchant Iron commands 182.50. In the Haute Loire, business is quiet, so far as the iron trade is concerned, and the railroads are concerned, but the government is giving orders of some importance. **Coal.**—Is inactive, and likely to remain so for some months to come, our ironmasters seemingly being resolved to buy from hand-to-mouth. The departments of the North, the Pas-de-Calais and Loire districts extract and sell little.

BELGIUM.

(Revue Universelle).

BRUSSELS., AUG. 12, 1877.—**Iron.**—Nothing of special interest has occurred during the week beyond adjudications. People on Wednesdays attend the Metal Exchange in this city, and on Tuesdays that of Liege, without transacting much business. At Charleroi prices are better sustained. In the neighboring grand duchy of Luxembourg Pig Iron is down to 182.50 francs the 100 kilos. Iron trade in Belgium do not entertain very sanguine expectations respecting the coming fall campaign. For the past four years we have been hoping from one season to another for a revival, but the continual disappointments to which ironmasters have been subjected have toned them down very much. At a recent adjudication 1300 tons of Iron Rails went at 182.50 francs per ton, and 1200 tons at 182.50 francs per ton of 2000 tons was knocked down at 182.50 francs per ton at the works, payable 25 per cent in cash and 75 per cent in old rails. Of Steel Rails 10,000 tons were adjudicated at 182.50 francs, the lowest figure, the highest asked having been 182.50. In May the government paid for Iron Rails 182.50 at the works, and Steel Rails 182.50. An order has been received from the government for 2000 tons of Coal. The movement is in the market for 2000 tons for the state railroad, deliveries to commence October 15, 1877. This is a large quantity, and the government shows foresight in looking for a supply early in the season. We advise private consumers to take the same, and abandon their hestitating policy. Our different districts are inactive for the moment.

GERMANY.

(Borsenkalte).

HAMBURG., AUG. 11, 1877.—**Metal.**—Business as yet revives but slowly in the Metal trade. The decline in Metals all over the world, if we except the short improvement in Lead, has been almost universal. The fall in Lead has been the greatest, but the losses have been sustained more exclusively in the ports where the stocks had been allowed to accumulate, the inland dealers and consumers holding comparatively little, and this is still the case. The least revival in the demand for actual consumption of a genuine and lasting kind will therefore find the Metal trade at ruling low figures in a very good position in the interior. The fall in the price of Lead is due to the steady requirements of Russia for trade and war purposes, and it can easily be perceived that the future is if anything rather encouraging than otherwise, the more so as money is easy and crops are abundant. **Copper.**—Little in the way of dealings can be reported for the week. Prices favor buyers. Berlin is weak, and the different future programmes at 70 to 80 marks the go along. No clear heading can be made. The market has become completely paralyzed by reason of the unfavorable statistical position and the apprehension of large Australian shipments. Berlin quotes Banca, 72 to 74.25, and English, 72 to 73.25 marks the 50 kilos. **Lead.**—Has kept tolerably steady; Tarnowitz, Harts and Saxonian are worth at Berlin 20.25 to 20.75 marks the 50 kilos. Spelter, 182.50 to 182.50, is quiet, and business is not improved. At Berlin Silver sells at 19 to 20 marks the 50 kilos., and in this city at 20.

HOLLAND.

(Koch & Vierboom.)

ROTTERDAM., AUG. 14, 1877.—**Tin.**—Banca, to be delivered from lots of the late sale, and the respondent, September 1, 1877, are sold at 182.50 guilders the 50 kilos. **Lead.**—Holberg has received 25 tons sold at 182.50 guilders, and 35 tons Eschweil at 12.

Our English Letter.

Review of the British Iron, Steel, Metal and Hardware Trades.

(From our Regular Correspondent.)

SHEFFIELD, Eng., Aug. 13, 1877.

THE WAR

is still our leading topic, and we are not as yet tired of hearing of or talking about it—not to mention the formidable task of perusing the miles of newspaper comments upon its various phases and incidents. Since I last wrote on your behalf there has been no very decisive movement on either side, but such engagements as have been reported all appear to have resulted in favor of the Turks. It is evident, indeed, that the Russians can do little this year beyond holding, and, it may be, clearing Bulgaria up to and including one of the Balkan passes. If they can manage this they will do well. Some people think they won't be able even to perform this part of the programme, and prophecy a winter camp north of the Danube for the Czar and his staff. Popular opinion in this country, I may say, is rejoiced at the Russian reverses, although the traders are troubled at the prospects of a long-continued war.

THE TRADE OUTLOOK

is thereby clouded very seriously. A broad survey of the commercial horizon fails to reveal any break whatever, and even cursory observation of current matters tells

most plainly how dull every branch of business is—despite the seeming contradiction afforded by the Board of Trade returns for July, which show a slight increase in the value of our exports as compared with last year. In no direction, nevertheless, can one hear of activity or of orders being in hand which will carry on works a little ahead of the present, with the exception of a few railmaking concerns, and at one or two establishments where patented specialties are made. These exceptions, however, rather illustrate the force of the general rule than anything else, and stand out as prominently as do the pyramids from the dead level of the Egyptian deserts. The only consolation we have is that trade is, at all events, being conducted on a really sound basis—a fact which may fairly be inferred from the very few failures of large caliber which have recently characterized the iron trade.

THE COLORADO BEETLE

has at length reached our shores, per Spanish steamer Carolina, from New York for Liverpool. A specimen was seen in the cabin by a Liverpudian, and he carefully secured it alive. It was then duly and officially identified, and an eminent entomologist was subsequently sent down to Liverpool to investigate. An Act of Parliament has also been passed which is specially leveled at the peripatetic beetle tribe, and gives power to the Privy Council to make orders for preventing the introducing into Great Britain of "the insect designed as the Doryphora Decimelineata and commonly called the Colorado beetle." Any person found in possession of the living insect may be fined £10, and crops in which the insect may be, will be destroyed and compensation provided.

MR. BRIGHT ON AUSTRALIAN PROTECTION.

Mr. John Bright, the great Liberal leader, friend of Cobden and a thorough free trader, having been charged with saying that the State ought to grant bonuses to certain industries in Australia and Canada, has written in correction of the report—as circulated in a speech made by the Hon. John Young, of Montreal, on the occasion of a dinner given by the Melbourne Chamber of Commerce—as follows:

"DEAR MR. POTTER: I thank you for sending me Mr. Langton's letter of the 10th of June from Melbourne. By the same mail I have three other letters on the same subject on which Mr. Langton has written to you, one from the secretary of the Free Trade League of Victoria, one from Sir Charles Gavan Duffy, and one written at Suez by Mr. John Young, of Montreal, to whom the dinner at Melbourne was given. I need not tell you that I am surprised and amused at the stir which so small a matter has caused among our friends on the other side of the globe. I recollect meeting Sir Charles Gavan Duffy on his visit to this country, but I have not the least recollection that we had any conversation on the subject of protection, or on the policy of the Province of Victoria on that question. If any such conversation took place, I can say with confidence that my views have been entirely misunderstood and misrepresented by Sir Charles. The words he puts into my mouth are very much like in meaning to what I think I have seen in some of the writings of Mr. John Stuart Mill, and it may be that Sir Charles may have inadvertently attributed to me what he has heard from Mr. Mill or read in some of his works. If a government voted a sum of money to support a steam-boat enterprise which was deemed of great service to the country, but which from its novelty or its risk private capitalists would not undertake, I should say in doing this no sound principle would be broken, and that the public interest might possibly be wisely served. So if a government thought that a new culture might be introduced into the country, such as the grape or tea, it might appropriate a sum of money to make that experiment, leaving its future progress or fate entirely to the industry and disposition of the people. But to enact a tariff imposing heavy duties on important articles of import, to establish an oppressive and costly system of custom houses, to build up special interests before their time, or industries which might never thrive in the free air of competition, at the expense of taxation upon the whole people, levied partly at the custom houses and partly by the high prices which are sought to be obtained on the home-made and protected article, is a policy so unsound and injurious that I am greatly surprised that any one in the least acquainted with me or my life should have supposed it possible that I should give it my support. Englishmen form colonies at a distance from the mother country. They throw off many of the superstitions which are still to a large extent cherished in England. In respect to protection by means of a prohibitive or restrictive tariff the colony of Victoria clings to a superstition or error which we in England have abandoned. Our experience is conclusive as to the wisdom of our policy. Victoria is young, and thinks she knows more and better than we know. But when she finds herself not at the head but at the tail of the great Australian communities as to her success and the growth of wealth, she may discover that industry has no greater enemy than a protective or restrictive tariff. If you will kindly send this letter to your correspondent, Mr. Langton, it will not be necessary for me to write to Sir Charles Duffy or to the secretary of the Free Trade League of Victoria. Believe me, &c., JOHN BRIGHT."

Nobody can preach free trade better or more forcibly than Mr. Bright, whose honesty of opinion nobody can for one moment doubt, yet who is, after all, a partial witness because he is a British manufacturer and doubtless trades largely with Australia.

IRON AND STEEL RAILS.

During the seven months ending July 31 we exported 126,684 tons of steel rails, as against 63,737 tons last year up to the same date, but, on the other hand, we have only sent off 112,427 tons of iron rails, as compared with 133,063 tons last year, thus proving that steel is rapidly replacing iron.

BRITISH SHIPPING

is still on the increase—a fact further confirmed by the latest report of the Registrar General of Shipping: "The aggregate ton-

nage of registered vessels existing on the registry has risen from 7,297,984 tons in 1866 to 7,964,578 tons in 1876. In the United Kingdom, from 5,692,010 tons to 6,197,968 tons; and in the British Plantations, from 1,518,647 tons to 1,701,245, the Channel Islands showing a decrease from 87,327 tons to 65,365 tons. The number of vessels has fallen from a total of 40,922 to 37,680, and the number of men in 1876—namely, 348,959—shows very little increase.

THE "WORK AND WAGES"

heading of the daily papers is just now pretty well supplied with paragraphs, by reason of the disputes existing in the different parts of the country. A telegram this morning states that 1400 men have struck for an advance of wages at the Nantyglo and Blaina collieries, South Wales, and that "great excitement exists in the neighborhood." At other pits of the same district disputes "exist." The strike of the Manchester and Salford joiners has now lasted fifteen weeks, the number of men out being 800. The committee of strikers in this case held a meeting on Saturday, in order to discuss the question of the importation of carpenters and joiners from New York, a number of "trade communications" from the society in that city being laid before the meeting. This question, I hear, may lead to trouble shortly. The men at the Mapperley, Kilburn and Rutland collieries, Derbyshire, have accepted reductions of wages. There is much distress among the Warwickshire weavers of ribbons, &c. The strike of London masons continues, as also does the dispute with the Clyde shipbuilders and the Fife miners. In East Scotland all the operatives' wages will be lowered 5 per cent. on Thursday, August 16. Mr. Macdonald, in dealing out his customary weekly (and weekly) advice, has told a meeting (at Pontefract) of 20,000 miners and others that the sole cause of the present depression of the iron and coal trades is "the large output consequent upon the greater number of pits sunk and the limited demand."

THE BOARD OF TRADE RETURNS

just issued, showing the quantities and values of our exports during the month of July, are rather more encouraging, inasmuch as they show an increase of about 9 per cent., as compared with the same month of last year. The total value last month was £17,537,301, as against £16,084,587 in July, 1876. A glance over the leading items shows that there was no increase in small firearms, unwrought steel and some other articles—such as machinery—but that there was a fair expansion as regards hardware and cutlery, brass manufactures, coal, pig iron, bars and angles, railroad iron, iron and steel wire, hoops and sheets, lead, plated wares, telegraph wires and unwrought tin. The leading quantities and values are as under:

	Quantities—	Values—
	1876.	1877.
G. M. B., at Glasgow.....	19,153	17,147
Brass, manufacturers of, not a heavy ordnance, cwt.s.....	6,680	9,460
Railway carriages for passengers, No.	46	28
Railway trucks, cwt.s.....	529	83
Coal, cwt.s, &c.	1,562,377	1,586,307
Cop. wrought cwt.s.....	12,611	18,705
Cop. wrought cwt.s.....	17,186	18,996
Hdw. & c'l'r'ys, tins, &c.	79,056	81,954
Bar, a gage, tins, &c.	18,309	21,151
Railroad &c. tons.....	41,702	52,375
Iron and steel wire (except telegraph), galv'an'd or not, tons.....	3,069	4,432
Hoops, ab'ta, iron, tons.....	16,927	17,223
Tin plates, tons.....	11,103	12,158
Cast or wrdg. Oid, for re-manufacture, tons.....	27,744	26,467
Steam engines, steam &c. &c.	3,089	3,609
Steel unwr'd, tons.....	2,175	2,099
M'nufcts'rs of steel or steel & iron, tons.....	1,054	1,100
Lend-Pig, rolled, &c.	1,768	4,116
Steam eng'ns, steam &c.	193,550	185,868
Plates and plated and gilt w'res....	46,740	43,785
Telegh' w'res and apparatus connected therewith.....	24,988	113,121
Tin (unwro't.) cwt.s.....	7,782	9,205
Total.....	193,550	185,868

STEAM ENGINES.

	1876.	1877.
To Russia.....	23,108	9,922
Germany.....	7,322	10,812
France.....	2,827	1,825
Spain and Canaries.....	13,099	11,657
Italy.....	18,710	3,226
Egypt.....	3,246	655
Brazil.....	13,700	3,703
British India.....	11,878	39,682
Australia.....	17,556	17,378
Other countries.....	81,705	76,108
Total.....	469,746	437,885

OTHER MACHINERY.

	1876.	1877.</
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traveling trunks and baths and toilet ware thus far has been much below the average. For the moment, the orders run chiefly upon trays, cash and deed boxes, and coal vases. Edge-tool makers for the most part continue well employed on Indian and other orders. There is a little now doing in the lamp trade. There is no general improvement to report in the jewelry branch, but individual firms here and there report less stagnation. The gilt jewelry branch also may be reported a shade better. In the button trade ivory goods continue in strong request. The steel toy trade is quiet. Prices all round are steady."

SOUTH WALES AND MONMOUTHSHIRE.

The iron trade of these districts is rather better, last week's shipments having been 6000 tons, of which there were 4000 tons of rails from Cardiff. Of these rails 1600 tons were for Bolivia, 1100 for Christiana, 800 for Gothenburg and 500 for Santos. At Blaenavon a heavy iron rail order has been secured and at Llynvy a good bar order for Malta. At Pentrech Tin Plate Works, Dutch orders are in hand. At Gadlyns, coke plates are 18/6 per box and at some other places 18/. A hope is expressed that the Great Western Railway Company may acquire the now dormant Plymouth Iron Works for its own uses, the company having placed orders for 100,000 tons of rails within two years past. Last week 20 barrels of nails from Antwerp arrived at Swansea, to the great astonishment of the native iron and hardware men. The coal trade appears to have revived a little, last week's shipments having reached nearly 100,000 tons. The Crom Avon Works, Glamorganshire, formerly worked by the Governor and Company of Copper Miners of England, have been acquired by the Copper Miners' Tin Plate Company (Limited), which has a capital of £84,000 in £50 shares, and has the following gentlemen as the "first subscribers": Henry Nash, Tower Buildings North, Liverpool, merchant; Elisha Smith, same address, merchant; James Whatman, London; Philip William Flower, Briton Ferry, Glamorgan, manufacturer; Robert V. Leach, Devizes; F. D. Wickham, Bath, and H. A. Bartlett, Great Yarmouth.

THE METAL MARKETS
have been very quiet, with a small amount of business doing.

Von Dadelszen & North report: "Copper unchanged. Chili bars, G. O. B., £68. 15/ to £69, with little doing. Wallaroo cake sold in small lots at £80; Burra, £75 to £75/; English tough, £74. 10/ to £75. 10/; select, £76 to £77; Sheets, £81. Tin very dull; prices about 10/- lower. Of Straits there are sellers at £66, and Australian has been sold at £65, and still offers theret. Dutch market very dull; Banca, 41fl.; Billiton, 39½fl.; English ingot, £70 to £71. Tin plates quiet. Lead dull; £20 to £20. 7/6 for English; £20 for soft Spanish. Spelter dull; quoted £19. 5/ to £19. 10/ for ordinary brands, and £20 for special brands. Quicksilver quiet; the importer still quotes £9. 10/; small second-hand lots sold at £9. 2/6 to £9. 5/." *Antimony*, £43."

London official closing report of the Lombard Exchange, August 10th (evening): "Copper firm; about 600 tons of Chili bars on the spot, Swansons and Liverpool, sold at £68. 15/ and £69; Wallaroo, £80, and Burra, £75 to £75. 5; English tough, £74 to £75. 10/; best selected, £76 to £77; sheets, £81. Tin dull; Straits quoted £35. 10/ to £66; Australian sold at £64. 15/; English ingots, £70. Scotch pig iron firm at 55/4½, cash; 55/6 one month. English pig lead, £20 to £20. 7/6; soft Spanish without silver, £19. 17/6 to £20. Spelter quiet at £19. 5/ to £19. 10/." Quicksilver, £9; *Antimony*, £48."

The Mining Journal remarks: "Copper.—A fair inquiry has existed for Australian, but chiefly for Burra, owing to the scarcity and dearness of Wallaroo. Burra is now the cheapest kind of copper to be met with in the market, but there is comparatively little to be obtained, and unless buyers come forward quickly they will certainly have to pay dear prices for it, as there is good room for a considerable rise in the market quotation compared with Wallaroo, and holders are very firm, and well able to maintain their position; £80 per ton has been realized for Wallaroo. Lead.—Our market has been very quiet, and the tendency seems to be slightly in favor of buyers. Quicksilver.—The price in first hands has been reduced to day to £9, but there is not much doing, and second-hand lots have been selling fully 5/- per bottle below the fixed price. Spelter.—The market is quiet, and prices continue easy. Tin Plates.—A fair business is doing for some markets, but the demand is not general. For America the shipments are satisfactory, but for the Mediterranean orders are scarce. Tin.—This market continues to drop, and there seems to be more pressure to sell now than for some time past; holders are evidently losing confidence in the market, and think it better to realize at once rather than take the risk of holding any longer."

No change at Liverpool.
Iron, f. o. b. in Liverpool, per ton.

	£ s. d.	£ s. d.
Merchant bar	6 10 0	6 15 0
" in Wales	6 0 0	6 5 0
Staffordshire	7 0 0	9 13 0
Hoop.	7 10 0	8 10 0
Sh. nail	6 15 0	9 13 0
Nail rod.	7 0 0	9 0 0
Bar, best crown.	7 0 0	9 0 0
Boiler plates	9 0 0	10 0 0

Tin Plates, f. o. b. in Liverpool, per box.

	£ s. d.	£ s. d.
Charcoal, L. C.	1 2 0	1 4 0
Coke, I. C.	1 9 0	1 0 0
<i>Copper, delivered in Liverpool, per ton.</i>		
Bolt and sheathing	8 2 0	8 0 0
Tile.	7 5 0	8 0 0
Tough cake.	7 6 0	8 0 0
Best selected	7 7 0	8 0 0

Steam Boilers and their Management.

Steam boilers are coming into such general use, through the introduction of steam-heating and small engines, that the management and care of them is a matter of general interest to a very large class of our readers. Mr. Roper, in his book on the Steam Boiler, has a great deal that is of value upon the subject. In speaking of boiler explosions, he says:

The sooner steam users and engineers discard all theories in connection with steam-boiler explosions, and come to the conclusion that when a boiler explodes one of two

things is certain—either that the pressure was too great for the boiler, or that the boiler was not equal to the pressure; that it gave way in the weakest place, and that the strength of any machine (the steam boiler included) must be measured by its weakest point, and that the sooner this principle is universally recognized the better it will be for every steam-using community. A weak spot, a flaw, or a crack in a boiler does not improve by use, and when any machine breaks down at a point which shows that it must have been weak for a long time, no one thinks of going into a long discussion or explanation of the mysterious agencies which were suddenly brought to bear on it and cause it to break. Not so, however, with a steam boiler; it may have been burned, corroded and cracked for years, and when at last it explodes there are always to be found those who wish to involve the whole thing in mystery and tell how it must have occurred, who are always unable to tell how it might have been prevented.

Within the past eight years, mainly through the operations of the Hartford Steam Boiler Inspection and Insurance Company, steam boiler explosions have been stripped of the mystery in which visionary theorists had so long enshrouded them, and the belief in such heresy as mysterious steam boiler explosions is principally confined to those who are incapable of or unwilling to be convinced, even when the facts are laid before them. The class of persons of all others that ought to encourage such theories and take refuge behind them, when called upon to pay damages in case of accident, are those who discount such theories when accounting for boiler explosions, and the correctness of their views is sufficiently attested by the almost entire absence of serious accidents in connection with the thousands of boilers of all sorts and conditions that are have been in their care for several years past.

Few have any idea of the extent to which steam is used in our large cities, or of the risks to which even those who have no interest in the boilers, and who are not connected in any way with the business in which they are used, are exposed. In almost every building along our principal thoroughfares may be found a large boiler, used for heating purposes or for furnishing power, which is concealed from public view. It is only when the public are startled by an explosion, and by the death or injury of innocent persons, that the true condition of things is revealed, and that the dangers incurred by every passer-by are exposed.

Further on he says: No class of men are intrusted with greater responsibilities, none hold in their keeping more important interests of life and property, than those having the charge of steam boilers. A mistake in judgment at a critical point, or a careless neglect of duty, may cause, and has often resulted in, terrible destruction to life and property.

Although the management of a large boiler needs a great deal of skill and care, an intelligent and careful man may easily qualify himself to take charge of a boiler and run it with safety and economy.

A very mischievous practice exists in various parts of the country in reference to starting fires under steam boilers preparatory to raising steam. This duty is intrusted to ignorant watchmen, who are too often the agents of disaster. These men are instructed to light the fire at a certain hour, and comply with their orders without exercising the least judgment on the subject. Numerous instances are on record where watchmen have started the fires under steam boilers and raised steam before discovering that there was insufficient water in the boilers, thus incurring the risk of burning the boilers, if not actually ruining them. No persons ought to be permitted to meddle in any way with the steam boiler except those who are skilled in the management of them, and who are fully conversant with the properties of steam. Thousands of lives are lost and much valuable property destroyed through the ignorance of those left temporarily in charge of steam boilers.

We think the following directions will prove very serviceable to all who have anything to do with a boiler:

The first duty of an engineer or fireman when he enters his boiler room in the morning is to try the boiler gauge cocks and ascertain if their is a sufficient supply of water. Many boilers have been badly injured from neglect of this precaution. Fires are often replenished, and when well started attention is directed to the water in the boiler. If from any cause during the night the water has escaped, the result may be a burned sheet or probably still more serious injury.

Too much reliance should never be placed on self-acting apparatus, such as gongs, floats, steam or alarm whistles, for regulating the height of the water in steam boilers, as, even if they act with certainty, they provide only against one or two contingencies, while the dangers to which steam boilers are exposed are numerous.

The glass water gauge, though one of the simplest, most beautiful and useful attachments of the steam boiler, should not be relied upon altogether to show the level of the water in the boiler.

The gauge cocks should be kept clean and in constant use, as they furnish the most reliable means of ascertaining the height of the water in a steam boiler.

The furnace door should never be allowed to remain open longer than is sufficient to clean and replenish the fire, as the contraction of the tubes and flues, induced by the cooling down of the furnace, has a very mischievous effect on all parts of the boiler exposed to the cold draught.

The feed water should be sent into the boiler as hot as possible, as, if it is forced in at a low temperature, it will impinge on that portion of the boiler with which it comes in contact, and, as a result of the continual expansion and contraction induced by the varying temperature of the water, the boiler is liable to crack and become leaky.

If, from neglect or any other cause, the water in the boiler should become dangerously low, the fire-doors and damper should be immediately thrown open, for the purpose of admitting the cold air to the heated plates, and the fire withdrawn as soon as possible.

Under such circumstances no attempt should be made to introduce cold water into the boiler, or disturb the safety-valve, as either might be attended with disastrous results.

The safety-valve should always be moved before the fire is started to get up steam, for the purpose of ascertaining if it is in good working order. It should also be raised whenever the boiler is being filled with cold water in order to allow the air to escape, as air has a tendency to retard the influx of the water, and also to occupy the steam room when steam is raised.

All new boilers should be thoroughly examined before being filled with water, to ascertain if there are any tools, wood, lamps, greasy waste, &c., left behind by the boiler makers, that would be liable to be carried into connections or cause the boiler to foam.

In getting up steam in boilers just filled with cold water, or that have been out of use for some time, the fire should be allowed to burn moderately at first, in order to admit of the slow and uniform expansion of all parts of the boiler; as, when the fire is allowed to burn rapidly from the first start, some parts become expanded to their utmost limits, while others are as yet nearly cold, thereby subjecting the boiler to fearful strains, induced by unequal expansion and contraction, which frequently results in leakage, fracture and sagging of the shell or flues.

When the weight is once fixed on the lever of a safety-valve, at the right point to retain the safe working pressure, the extra length of the lever should be cut off.

The fuel supply and the firing should be as steady and as regular as possible, as frequent and extreme alterations of temperature, especially with boilers carrying a high pressure, or irregularities of any kind, have a very injurious effect.

Ashes should never be allowed to accumulate around the water-legs of fire-box boilers, or the water-bottom of any boiler, as wet ashes, like any other lye, corrodes, and eventually destroys the iron.

Boiler flues should never be allowed to become choked with ashes, nor the sh. sh. to become coated with soot, as it very much impairs the efficiency of the heating surface and induces a wasteful consumption of fuel. The flues and tubes of boilers should be swept out at least once a week. This is a very important object in point of economy, as, when the flues become choked with ashes, it requires an extra expenditure of fuel to generate the necessary quantity of steam. Care and attention to little matters in managing steam boiler fires will not only add to the working age of a boiler, but save materially in the consumption of fuel.

Boilers should never be filled with cold water while they are hot, as it causes contraction of the seams and stays, often inducing fracture of stays or leakage in the seams and tubes. The tubes of boilers being generally of thinner material than the shell, cool and contract sooner. For this reason, the boiler should never be filled with cold water while the tubes are hot.

One of the most common causes of damage in steam boilers, and also of leakage of the seams and under side, and at the junction of the tubes and tube sheets, is the reckless practice of blowing out the boiler while still hot and filling it again with cold water. Under such circumstances, the contraction of the crown sheet, tube sheets and tubes is so rapid and unequal, that, if persisted in, the result is the ruin of the boiler.

Mr. Roper's remarks in regard to the danger from a gradual increase of pressure when the engine is at rest deserve attention. He says: When an engine is stopped, if the steam should increase to an excessive pressure, the safety-valve should not be moved, as any sudden release of the steam might be attended with risk; it is better to open the furnace door, cover the fire with fresh fuel and turn on the water feed; this will have a tendency to lower the temperature and keep up the circulation in the boiler, so essential to safety when the steam is shut off and a hot fire in the furnace.

It frequently happens that boilers, which have been standing a long time with steam up, explode just after the engine has started. This usually happens where the boilers contain a large amount of water which has had an opportunity to become thoroughly heated. When the pressure is suddenly reduced, a considerable portion of this flashes into steam at once, and throws, instantaneously, an enormous strain upon the plates, causing an explosion.

When boilers are to be cleaned they should be allowed to stand for several hours and cool before the water is run out; the deposit of mud and scale will then be found to be quite soft, and can easily be removed or washed out with a hose from all accessible parts. There is a very erroneous impression existing among engineers and steam users, that blowing out a boiler under a high pressure has a tendency to remove the mud or deposit; this, however, is a mistake, as the contraction of the different parts of the boiler, induced by so sudden changes of temperature, has a tendency to induce leakage of the seams and round the rivets and ends of the tubes.

It is a very general impression among engineers and firemen, and receives encouragement from those who sell nostrums for the prevention and removal of scale, that so long as the mud and deposit is retained in the soft and slushy state, it can do the boiler no harm. This is undoubtedly a mistake, as it retards the escape of the heat from the fire to the water, inducing overheating, which is generally followed by cracking and blistering of the plates and leaking at the seams.

The Modern Silversmith's Art.

Mr. Frederick Voss, in a communication to the Tribune, gives the following interesting information respecting the art of making hollow-ware in silver, as now practiced:

"The process of hammering up a piece is very long, and consequently expensive, as it is only used for pieces of great value. A more rapid and cheaper mode of manufacture is employed for such pieces as tea pots, cream and ice pitchers, etc. The first opera-

tion is to transform a 'skillet' or ingot of silver into a thin sheet of metal. This is done by rolling. When the skillet, weighing about 250 pounds, comes from the foundry,

wiered it has been made by pouring melted silver into a skillet mold, it is about 1½ inch thick, 8 inches long and 6 inches wide. It is then placed between heavy iron rollers; each roller is 3 feet long and from 10 to 12 inches in diameter. These rollers are horizontal and the space left clear between them is regulated by screws which when turned draw these large cylinders closer together. The moment the skillet is drawn through in between the rollers it takes about 40 horse steam power to make them revolve. This enormous force ceases to be required as soon as the silver comes out, but will be needed again when, after a turn of the screws has brought the rollers closer, the silver is again passed through. This renders necessary great perfection of work in the governor of the steam engine, which must be capable of furnishing at any moment a large extra power which will be thrown off soon after without any alteration of the normal running speed. The skillet is drawn through the rollers repeatedly, and each time a turn of the screws, drawing them closer together, produces a corresponding diminution in the thickness of the silver. By repeated rollings it is clear that the metal, which is very malleable, will diminish in thickness while it spreads in length and breadth—and, at a given time, it will come out from between the rollers as a thin sheet of metal.

"The mechanical process of 'spinning' is the next stage through which the silver is passed to make, for instance, a tea pot. A disk of metal of the required size is set on a spinning lathe, it is held in the center between two pieces of wood, one of which is used only to hold the silver in position, while the other represents the shape the silver has to be made into; this piece is named a 'chuck.' The lathe is now started, and the silver disk revolves with great rapidity. A workman armed with a burnisher, which is a tool over 2 feet long, including the wooden handle, now attacks the outer edge of the disk as it spins round, and using great pressure, brings the end of the tool, which is shaped like a round steel knob, in contact with the metal. The length of the tool—one part of which rests on a metallic bar, forming a part of the lathe, and technically termed a rest—gives the man a great power of leverage, and the silver disk, soon yielding to the pressure of the tool, is curved in, and, owing to the malleability of the metal, soon changes from the shape of a disk to that of a saucer, and eventually to that of a bowl. The operation is continued until the metal is made to fit close, or to 'hug,' as it is termed, the shape of the 'chuck.' This chuck, which is exactly of the shape to be assumed by the silver, is constructed in sections like a shoe-last, and by withdrawing the center piece can be easily removed.

"When the operation of spinning is concluded, we have, for instance, two pieces of silver, which are intended to form the lower and upper parts of a teapot. These two pieces are taken to the silversmith, who will unite them to make the body of the teapot. To do this he takes a long band of silver, on one side of which a decorative pattern has been stamped by passing it through steel rollers, on one of which is cut the pattern to be reproduced. The pressure of the rolling prints the design on the silver. This band of metal is shaped into a circle, forming as it were the 'equator' of the teapot, and the two half shapes of the body are soldered to it. The spout, handle and cover, are next placed in the proper position, and the piece passes to the finisher. The finisher first removes all the inequalities of the surface with pumice stone, and when the outside of the teapot is perfectly smooth it is placed on a polishing lathe. The brushes of the machine are circular, and revolve with great velocity—over three thousand turns a minute. They are made of a great number of thicknesses of Canton flannel, cut out with a circular punch and then strongly fastened together at the center by wire clamps. Successive passages from one brush to another, the first one impregnated with oil and rotten stone, the last, covered with ordinary rouge, brings on the surface of the metal a smooth polish like that of a crystal mirror. In some cases a peculiar, dull surface, called 'satin finish,' is thought more suitable to the aspect of the piece. It consists in slightly indenting the surface of the silver with blows struck by hard wire brushes worked by steam which give the metal the appearance of being covered with a minute crystallization. Different colors of gold and metallic oxides are often used to decorate the surface of silver. Electricity is of much service to the manufacturer in all these operations, and in a future letter I shall give a full account of methods employed, both for color, gilding, and producing pieces by the electro-deposit of metals. Many pieces of hollow-ware are decorated with chasing, engraving and hammering work before they are polished. Silver waiters are hammered out on large flat anvils, and the particular curve around the edge is produced with a 'swadge' hammer. The process of 'swadding' is very frequently used in the manufacture of tin and iron ware, and consists in hammering the metal with one hammer the face of which is cut like the profile of the curve to be given to the metal, which rests on a small anvil the same size as the hammer's head, and bearing the exact counterpart of the curve on the face of the hammer. The metal struck between these pieces of iron soon retains the form of the 'swadge.' Often an ornamental border of rolled silver is soldered on the edge of the ware, while the center is decorated with engraving. The very interesting manufacture of spoons and forks is worthy of special attention. I will describe it at some future time."

Novelty in Railroad Construction.

The Alabama and Chattanooga Railroad, 295 miles long, has been in financial difficulties since the formation of the company in 1868, by the consolidation of the Northwestern and Southeastern Alabama Railroads. After passing through the hands of three receivers it was finally purchased by Messrs. Emile Erlanger & Co., of London, for \$1,480,000. These gentlemen have issued a circular to the apparently apathetic first

EATON, COLE & BURNHAM CO.,

58 John Street, New York.
MANUFACTURERS OF

Wrought Iron

PIPE,

Cast Iron

FLANGED PIPE,

Cast Iron

RADIATORS

and BOILERS.

STEAM GAUGES, TOOLS,

And all Supplies used by Machinists, &c.

Brass & Iron

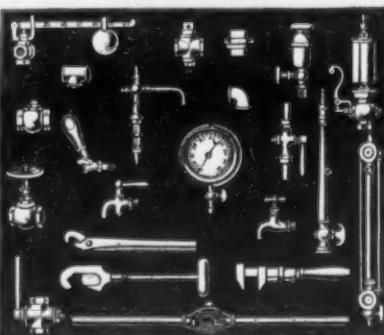
STEAM

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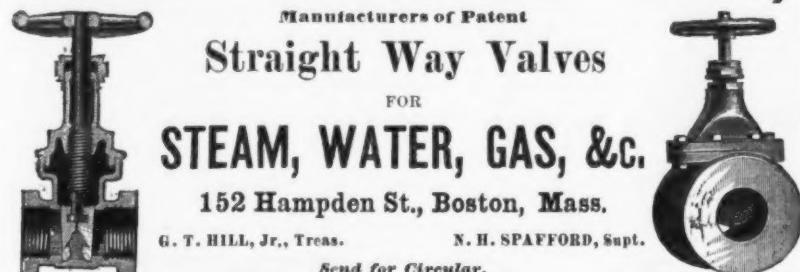
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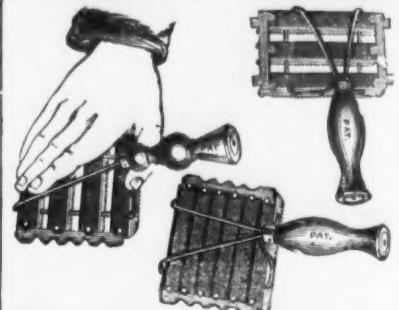
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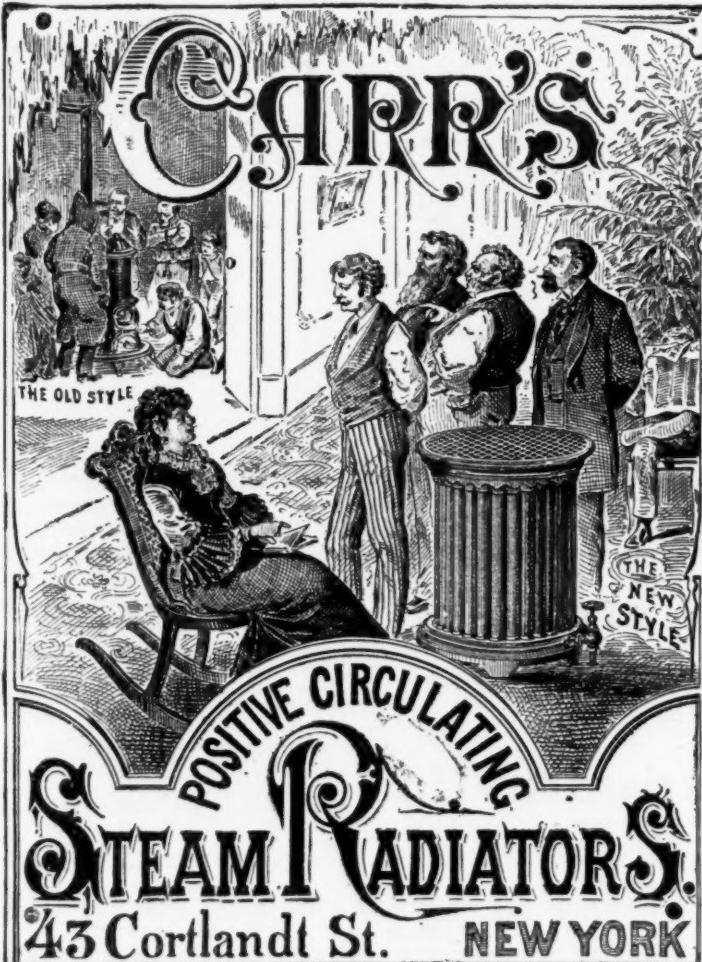
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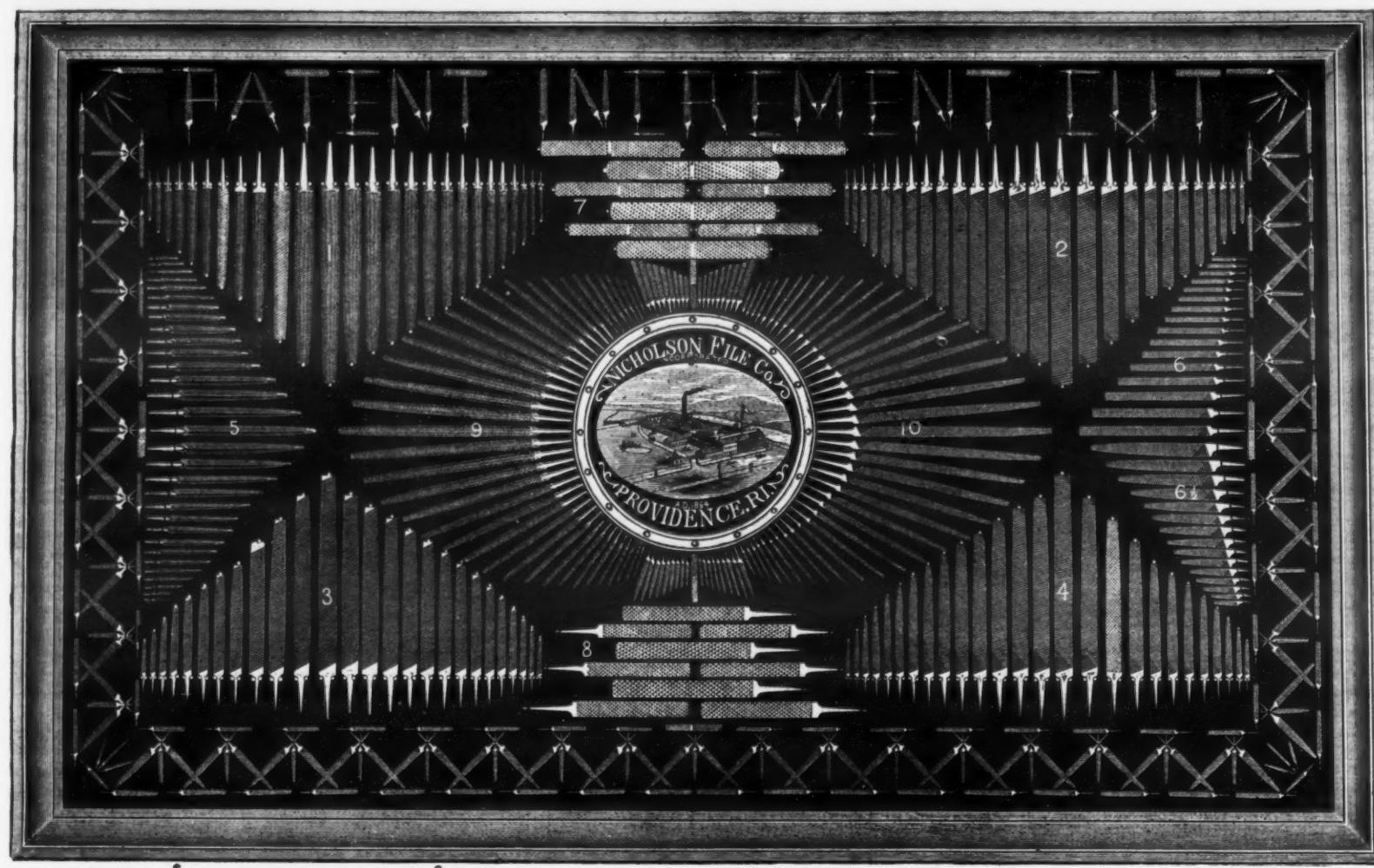
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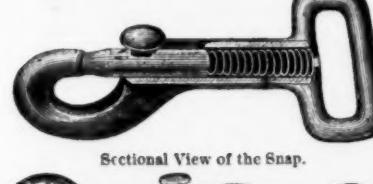
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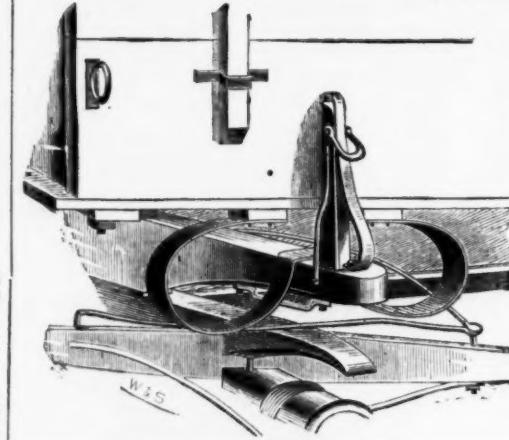
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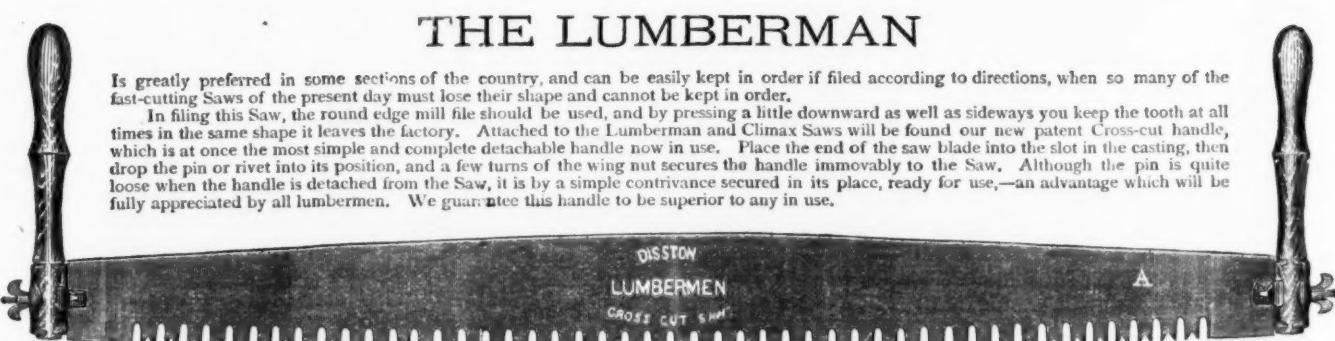
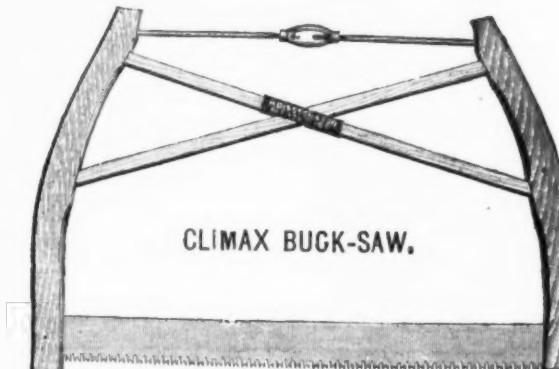
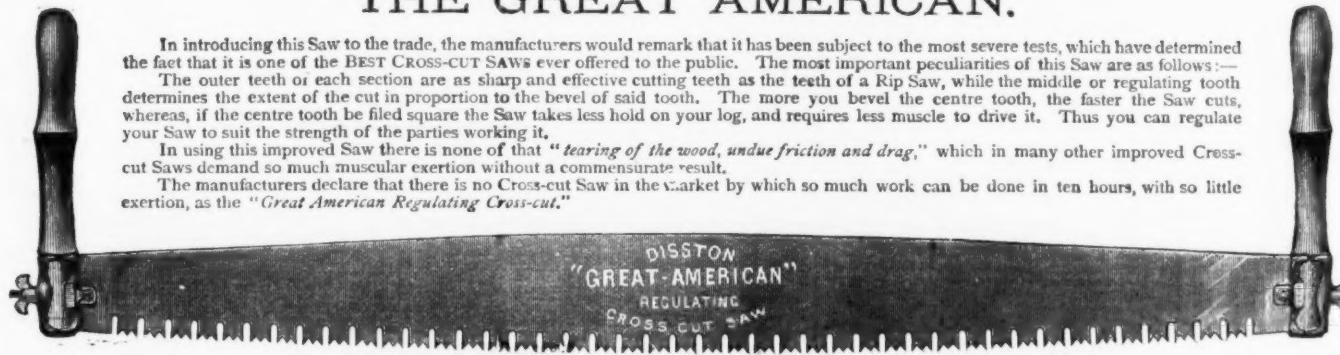
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In introducing this Saw to the trade, the manufacturers would remark that it has been subject to the most severe tests, which have determined the fact that it is one of the BEST CROSS-CUT SAWS ever offered to the public. The most important peculiarities of this Saw are as follows:—The outer teeth or each section are as sharp and effective cutting teeth as the teeth of a Rip Saw, while the middle or regulating tooth determines the extent of the cut in proportion to the bevel of said tooth. The more you bevel the centre tooth, the faster the Saw cuts, whereas, if the centre tooth be filed square the Saw takes less hold on your log, and requires less muscle to drive it. Thus you can regulate your Saw to suit the strength of the parties working it.

In using this improved Saw there is none of that "*tearing of the wood, undue friction and drag*," which in many other improved Cross-cut Saws demand so much muscular exertion without a commensurate result.

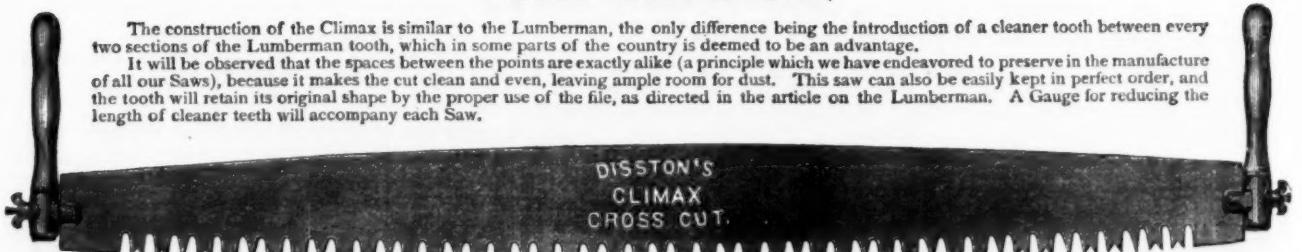
The manufacturers declare that there is no Cross-cut Saw in the market by which so much work can be done in ten hours, with so little exertion, as the "*Great American Regulating Cross-cut*."



THE CLIMAX.

The construction of the Climax is similar to the Lumberman, the only difference being the introduction of a cleaner tooth between every two sections of the Lumberman tooth, which in some parts of the country is deemed to be an advantage.

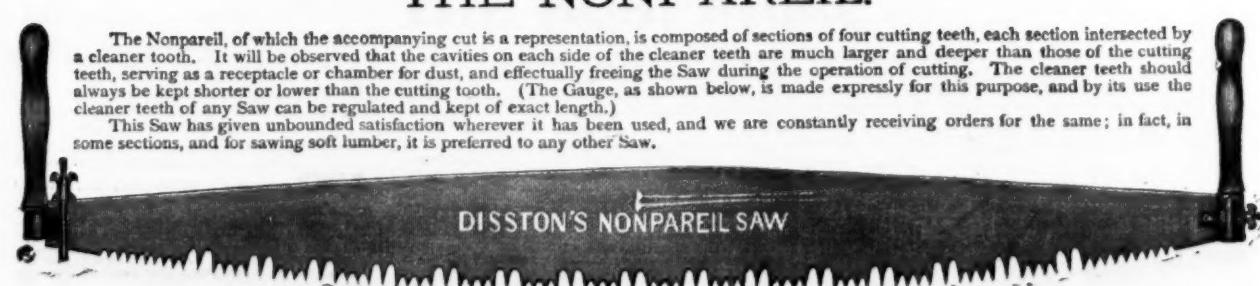
It will be observed that the spaces between the points are exactly alike (a principle which we have endeavored to preserve in the manufacture of all our Saws), because it makes the cut clean and even, leaving ample room for dust. This saw can also be easily kept in perfect order, and the tooth will retain its original shape by the proper use of the file, as directed in the article on the Lumberman. A Gauge for reducing the length of cleaner teeth will accompany each Saw.



THE NONPAREIL.

The Nonpareil, of which the accompanying cut is a representation, is composed of sections of four cutting teeth, each section intersected by a cleaner tooth. It will be observed that the cavities on each side of the cleaner teeth are much larger and deeper than those of the cutting teeth, serving as a receptacle or chamber for dust, and effectually freeing the Saw during the operation of cutting. The cleaner teeth should always be kept shorter or lower than the cutting tooth. (The Gauge, as shown below, is made expressly for this purpose, and by its use the cleaner teeth of any Saw can be regulated and kept of exact length.)

This Saw has given unbounded satisfaction wherever it has been used, and we are constantly receiving orders for the same; in fact, in some sections, and for sawing soft lumber, it is preferred to any other Saw.



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Wright's.	per gross \$10 00 over 220 lbs 11¢ gold
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Faultless Turn Table.	per doz 750¢
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" " Parmelee's.	small, 20¢; large,
" " \$30.	
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" " Ives' Adj.	per doz 12 00 dis 10¢
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" " Double Waterpoof.	14¢, 18¢, 20¢, gold
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" " Shouldered.	per gross 22¢ dis 10¢
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All other Spring Balances.	dis 25¢
Bands—rated.	new list 50¢, 10¢ & 5¢
Pom. Rhu.	new list 50¢, 10¢ & 5¢
Pom. Rhu.	new list 50¢, 10¢ & 5¢
Oreide.	
Bed Keys.	
Grav's Hatched.	per doz \$4 00, 10¢
Bells.	
Hand, Light Brass.	dis 10¢ & 5¢
" " Extra Heavy.	dis 10¢ & 10¢
" " White Metal.	dis 10¢ & 10¢
" " Silver Chime.	dis 10¢ & 10¢
" " Steel.	dis 10¢ & 10¢
" " Globe (Cone's Patent).	dis 20¢ & 10¢
Gong Abb'e's.	dis 20¢ & 10¢
" " Yankee.	dis 20¢ & 10¢
Brass.	dis 10¢ & 10¢
Clock Taylor's.	dis 20¢ & 10¢
" " Brook.	dis 20¢ & 10¢
" " Cone's.	dis 20¢ & 10¢
Lever, Sargent's.	dis 10¢ & 10¢
Taylor's Bronze or Plated Lever.	dis 10¢ & 10¢
Hart, Russel & Mauds' Co.	dis 10¢ & 10¢
Pull.	dis 10¢ & 10¢
" " Brook's.	dis 10¢ & 10¢
" " Western.	dis 10¢ & 10¢
Call.	dis 10¢ & 10¢
Cow.	dis 10¢ & 10¢
" " Western.	dis 10¢ & 10¢
Sargent's.	dis 10¢ & 10¢
Kentucky's.	dis 10¢ & 10¢
" " Sargent's.	dis 10¢ & 10¢
St. Germain Kentucky, new list.	No. 1, 1 1/2, 2, 3, 4, 5, 6, Hog.
No. 2, 1 1/2, 2, 3, 4, 5, 6, Hog.	dis 20¢ & 10¢
French, American.	dis 12 00, 10¢ & 5¢
Yankee.	dis 10¢ & 10¢
Texas.	dis 4 00
Bellows.	
Blacksmiths' Common.	dis 20¢ & 10¢
Extra and Extra-large Pattern.	dis 20¢ & 10¢
1 and Below.	dis 20¢ & 10¢
Blind Adjusters—Domestic.	dis 8¢ & 4¢
Blind Fasteners.	
MacKrell's.	dis 9¢
" " Sand's.	No. 2000, \$1400, 14 00, 12 00, 10 00, 8 00, 6 00, 4 00, 2 00.
" " old pattern.	per gross \$1200, 10 00
Waundour's Patent.	per gross \$1400, 12 00, 10 00
Terminus'.	per gross \$1200, 10 00, 8 00, 6 00, 4 00, 2 00.
Security Blind Fast.	per gross, \$1400, dis 10¢ & 5¢
Blind Staples.	
Boardman's Patent, 1/4 in. and larger F. B. dis 10¢ & 5¢	
" " 1/4 in.	16¢ dis 10¢ & 5¢
Blocks.	
Double Pulley Blocks.	dis 30¢
Tackie, Rose and Iron Slipped, Providence Tool Co.'s list.	dis 30¢ & 10¢
Stanley Rule and Level Co.	dis 25¢ & 10¢
Blowers.	
Keeler's Portable Forge Co.	dis 20¢
Cast Iron Barrels, Shutter, &c.	dis 40¢ & 10¢
Cast Iron Chain.	dis 40¢ & 10¢
Wrought Iron.	dis 40¢ & 10¢
Square.	dis 50¢ & 10¢
" " Shutter (Stanley's list).	dis 50¢ & 10¢
" " (Sargent's new list).	dis 50¢ & 10¢
Flange, Sheet Metal.	dis 20¢ & 10¢
" " Sargent's.	dis 20¢ & 10¢
Carriage and Tire, Common.	dis 75¢ & 1¢ each
" " Norway Iron.	dis 50¢ & 10¢
" " Philadelphia.	dis 50¢ & 10¢
" " Corium.	dis 6¢ & 10¢ & 6¢ & 10¢
" " Sheet.	(old list) 10¢ & 5¢
Star (Phila.).	dis 6¢ & 10¢ & 6¢ & 10¢
Stove-American Screw Co.	dis 40¢ & 10¢
" " B. & W.	dis 40¢ & 10¢
" " Standard Head.	dis 40¢ & 10¢
" " Union Nut Co.	dis 40¢ & 10¢
Plow, R. B. & W.	dis 40¢ & 10¢
Machine.	dis 60¢ & 20¢
Bolt Ends.	dis 10¢ & 5¢
Boring Machines.	
Upright, Angular.	
" " with Augers.	50¢, 75¢, 100¢, 125¢, 150¢, 175¢, 200¢, 225¢, 250¢, 275¢, 300¢, 325¢, 350¢, 375¢, 400¢, 425¢, 450¢, 475¢, 500¢, 525¢, 550¢, 575¢, 600¢, 625¢, 650¢, 675¢, 700¢, 725¢, 750¢, 775¢, 800¢, 825¢, 850¢, 875¢, 900¢, 925¢, 950¢, 975¢, 1000¢, 1025¢, 1050¢, 1075¢, 1100¢, 1125¢, 1150¢, 1175¢, 1200¢, 1225¢, 1250¢, 1275¢, 1300¢, 1325¢, 1350¢, 1375¢, 1400¢, 1425¢, 1450¢, 1475¢, 1500¢, 1525¢, 1550¢, 1575¢, 1600¢, 1625¢, 1650¢, 1675¢, 1700¢, 1725¢, 1750¢, 1775¢, 1800¢, 1825¢, 1850¢, 1875¢, 1900¢, 1925¢, 1950¢, 1975¢, 2000¢, 2025¢, 2050¢, 2075¢, 2100¢, 2125¢, 2150¢, 2175¢, 2200¢, 2225¢, 2250¢, 2275¢, 2300¢, 2325¢, 2350¢, 2375¢, 2400¢, 2425¢, 2450¢, 2475¢, 2500¢, 2525¢, 2550¢, 2575¢, 2600¢, 2625¢, 2650¢, 2675¢, 2700¢, 2725¢, 2750¢, 2775¢, 2800¢, 2825¢, 2850¢, 2875¢, 2900¢, 2925¢, 2950¢, 2975¢, 3000¢, 3025¢, 3050¢, 3075¢, 3100¢, 3125¢, 3150¢, 3175¢, 3200¢, 3225¢, 3250¢, 3275¢, 3300¢, 3325¢, 3350¢, 3375¢, 3400¢, 3425¢, 3450¢, 3475¢, 3500¢, 3525¢, 3550¢, 3575¢, 3600¢, 3625¢, 3650¢, 3675¢, 3700¢, 3725¢, 3750¢, 3775¢, 3800¢, 3825¢, 3850¢, 3875¢, 3900¢, 3925¢, 3950¢, 3975¢, 4000¢, 4025¢, 4050¢, 4075¢, 4100¢, 4125¢, 4150¢, 4175¢, 4200¢, 4225¢, 4250¢, 4275¢, 4300¢, 4325¢, 4350¢, 4375¢, 4400¢, 4425¢, 4450¢, 4475¢, 4500¢, 4525¢, 4550¢, 4575¢, 4600¢, 4625¢, 4650¢, 4675¢, 4700¢, 4725¢, 4750¢, 4775¢, 4800¢, 4825¢, 4850¢, 4875¢, 4900¢, 4925¢, 4950¢, 4975¢, 5000¢, 5025¢, 5050¢, 5075¢, 5100¢, 5125¢, 5150¢, 5175¢, 5200¢, 5225¢, 5250¢, 5275¢, 5300¢, 5325¢, 5350¢, 5375¢, 5400¢, 5425¢, 5450¢, 5475¢, 5500¢, 5525¢, 5550¢, 5575¢, 5600¢, 5625¢, 5650¢, 5675¢, 5700¢, 5725¢, 5750¢, 5775¢, 5800¢, 5825¢, 5850¢, 5875¢, 5900¢, 5925¢, 5950¢, 5975¢, 6000¢, 6025¢, 6050¢, 6075¢, 6100¢, 6125¢, 6150¢, 6175¢, 6200¢, 6225¢, 6250¢, 6275¢, 6300¢, 6325¢, 6350¢, 6375¢, 6400¢, 6425¢, 6450¢, 6475¢, 6500¢, 6525¢, 6550¢, 6575¢, 6600¢, 6625¢, 6650¢, 6675¢, 6700¢, 6725¢, 6750¢, 6775¢, 6800¢, 6825¢, 6850¢, 6875¢, 6900¢, 6925¢, 6950¢, 6975¢, 7000¢, 7025¢, 7050¢, 7075¢, 7100¢, 7125¢, 7150¢, 7175¢, 7200¢, 7225¢, 7250¢, 7275¢, 7300¢, 7325¢, 7350¢, 7375¢, 7400¢, 7425¢, 7450¢, 7475¢, 7500¢, 7525¢, 7550¢, 7575¢, 7600¢, 7625¢, 7650¢, 7675¢, 7700¢, 7725¢, 7750¢, 7775¢, 7800¢, 7825¢, 7850¢, 7875¢, 7900¢, 7925¢, 7950¢, 7975¢, 8000¢, 8025¢, 8050¢, 8075¢, 8100¢, 8125¢, 8150¢, 8175¢, 8200¢, 8225¢, 8250¢, 8275¢, 8300¢, 8325¢, 8350¢, 8375¢, 8400¢, 8425¢, 8450¢, 8475¢, 8500¢, 8525¢, 8550¢, 8575¢, 8600¢, 8625¢, 8650¢, 8675¢, 8700¢, 8725¢, 8750¢, 8775¢, 8800¢, 8825¢, 8850¢, 8875¢, 8900¢, 8925¢, 8950¢, 8975¢, 9000¢, 9025¢, 9050¢, 9075¢, 9100¢, 9125¢, 9150¢, 9175¢, 9200¢, 9225¢, 9250¢, 9275¢, 9300¢, 9325¢, 9350¢, 9375¢, 9400¢, 9425¢, 9450¢, 9475¢, 9500¢, 9525¢, 9550¢, 9575¢, 9600¢, 9625¢, 9650¢, 9675¢, 9700¢, 9725¢, 9750¢, 9775¢, 9800¢, 9825¢, 9850¢, 9875¢, 9900¢, 9925¢, 9950¢, 9975¢, 10000¢, 10025¢, 10050¢, 10075¢, 10100¢, 10125¢, 10150¢, 10175¢, 10200¢, 10225¢, 10250¢, 10275¢, 10300¢, 10325¢, 10350¢, 10375¢, 10400¢, 10425¢, 10450¢, 10475¢, 10500¢,

HOTCHKISS' PATENT "SUPERIOR" CURRY COMBS.

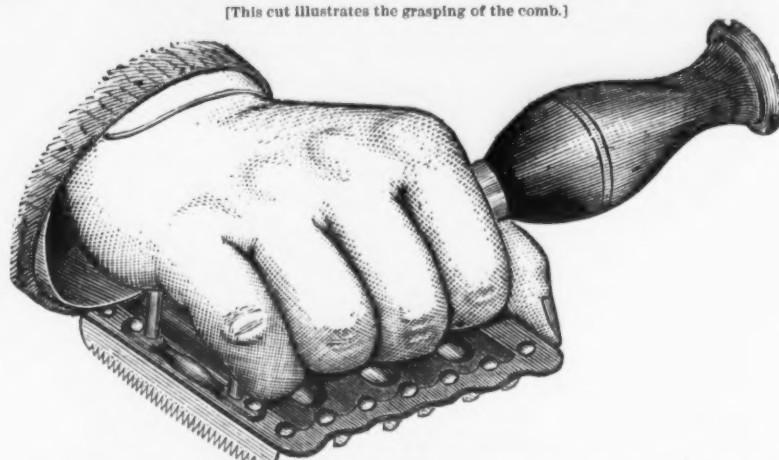
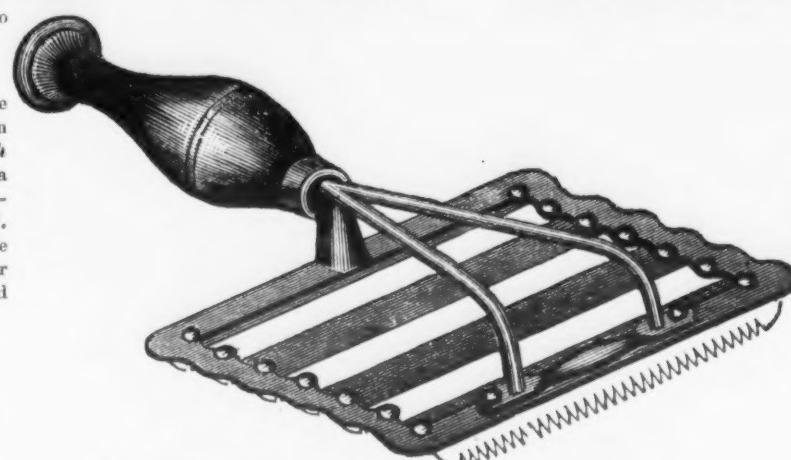
We invite the special attention of the trade to our

Patent "Superior" Curry Combs, which are the *best* and *most complete* side handle combs having a grasp over the back now in existence, and which for *neatness, strength* and *durability* have no equal. Give them a trial, and you will be convinced they are *superior* to any Curry Comb in the market. They are neatly put up in paper boxes of one dozen each, and packed 15 dozen in a case. For sale by the Jobbing Hardware, Saddlery and Wooden Ware trade.

HOTCHKISS' SONS,
Bridgeport, Conn.

SAMPLE AND WAREROOMS,
113 Chambers Street, N. Y.

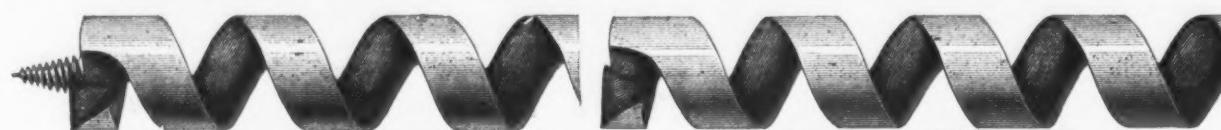
We do not propose to resort to printer's ink to decide any questions that may arise between the Lawrence Curry Comb Co. and ourselves, believing the court the proper place to determine all such matters.



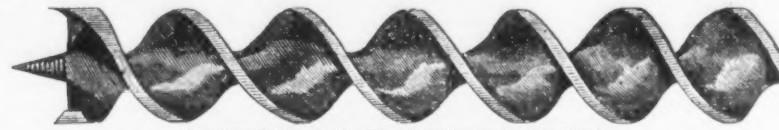
[This cut illustrates the grasping of the comb.]

HOTCHKISS' SONS,
C. A. HOTCHKISS, President.

J. L'HOMMEDIEU'S and WATROUS & CO.'S SHIP AUGERS, AUGER BITS, TRENAIL AUGERS, Etc.



Ship Augers, With Screw.



Nobles Mfg. Co.'s Double Spur Auger Bits.

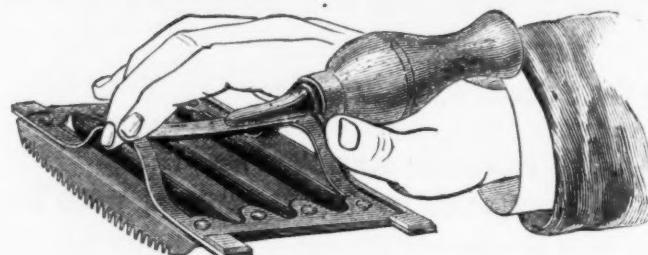
BROOK'S EDGE TOOL CO., SNELL MFG. CO., DAVIS LEVEL & TOOL CO., and P. MERRILL'S CHISELS,

We are the Sole Agents for, and take the entire production of, the following factories:

J. L'Hommedieu Ship Auger Works, Watrous & Co.'s Ship Auger Works, Nobles Mfg. Co., manufacturers of Extra Double Spur Auger Bits, Augers, Braces, Adjustable Handle Drawing Knives, Etc.

C. E. JENNINGS & CO., 98 Chambers Street, New York.

THE POPULAR CURRY COMB



Patent applied for.

A FULL LINE OF NEW CURRY COMBS.

Packed 3/4 doz. in strong paper boxes, 24 doz. in Wooden Cases. Send for price list.

WM. P. KELLOGG & CO., Troy, N. Y.

Wiebusch & Hilger Hardware Co., New York, Agents for the United States.



Have all the Latest Improvements,

And are made in a variety of styles—Wood Frame, Iron Frame, with Common Gears, Purchase Gears or without Gearing. All have Long Spiral Steel Springs, giving them Double the Capacity of any other Wringer and Greater Durability.

F. F. ADAMS & CO.,

ERIE, PA.,

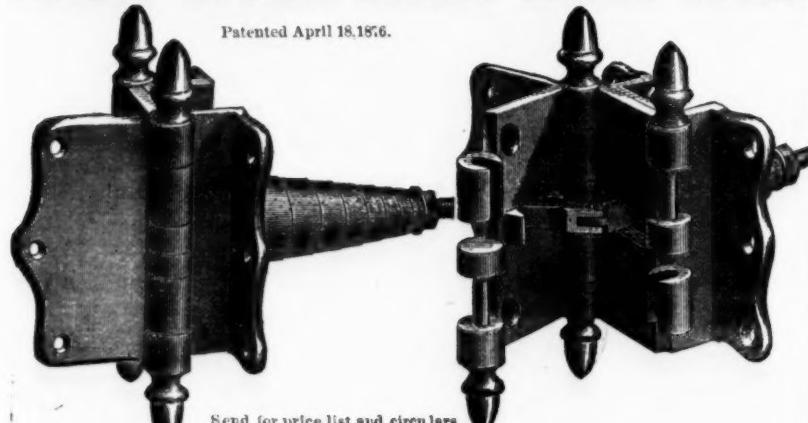
CHAS. D. & W. S. GRAHAM,

No. 88 Wall Street, New York,

AGENTS.

PATENT DOUBLE ACTING SPRING BUTTS.

Patented April 18, 1876.



Send for price list and circulars.

FOR SWINGING DOORS BOTH WAYS.

These Butts are the first ever constructed with two leaves only, and with flanges attached thereto for fastening to the door and jamb, thus rendering them much more substantial and easy to put on, as the screws are all driven from outside. The door is held firmly to the frame instead of a strip as is the case with all other double acting Butts, and therefore do not bear so heavily on the frame on one side as on the other. On the back of the Butt is a powerful Volute spring, and draws in direct line with the center of the door, thus holding the door firmly in position, and obviating all sag. Our price list is from 25 to 40 per cent. lower than others. Manufactured by

THE SABIN MFG. CO., Montpelier, Vt.

BAEDER, ADAMSON & CO.,
Manufacturers of SAND & EMERY PAPER & EMERY CLOTH.
(Also, in Rolls for machine work.)

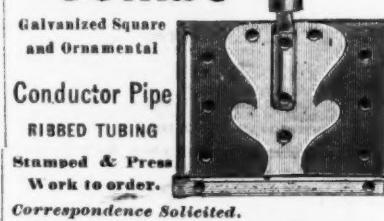
Ground Emery, Corundum & Flint, Clue & Curled Hair, Hair Felt, & Felt
ing for Covering Boilers, Pipes, &c., Cow Hide Whips.
Stores: PHILADELPHIA, 730 Market St.; BOSTON, 143 Milk St.;
NEW YORK, 67 Meekman St.; CHICAGO, 182 Lake St.

D. W. HAZLETON & CO.

724 Girard Ave., Philadelphia

Manufacturers of

Curry Combs



Correspondence Solicited.

DUPLEX Curry Comb

We call the attention of Hardware Dealers to our Double Curry Comb, comprising a fine and coarse size; or virtually two combs in one. It is useful, durable and novel, and needs no argument to convince any one of its practical value. It sells on sight, and is bound to supersede all other combs of the same class. We offer it in each State or large city to handle it. Correspondence solicited. Address I. N. CASSELL, Fredericksburg, Ohio.

SPECIALTY. COAL WASHING MACHINES AND IMPROVED COKE OVENS.

S. DIESCHER,
Civil and Mechanical Engineer,
Cor. Smithfield St. & 6th Ave., Pittsburgh, Pa.

Oldest and Largest Establishment of the kind in the U. S.

F. L. & D. R. CARNELL,
544 Germantown Avenue, Philadelphia

Manufacturers of Pennsylvania Brick Machine Little Giant Pipe Machine, Fire and Red Brick Presses, Clay Wheels, Tile Machines, Stampers, Grinding Pans, Brick Yards fitted out for running by steam or horse. Heavy and Light Castings. Send for circular.

Babcock's Sash Fastener,

PATENTED JAN. 11, 1874.

Needs but to be seen to be Appreciated.

Send for Circular. Sample, 30c.

C. P. BABCOCK, Portland, Me.

State Rights for Sale.

The Cheapest and most Durable Paint known for Cars, Roofs, Bridges, Iron, Brick and Wooden Buildings, etc. All Paint guaranteed as represented, and trial orders solicited.

Pittsburgh
Iron Paint Co.,
PITTSBURGH, PA.

CHAS. E. LITTLE, 59 Fulton St., N. Y.

Trade Mark.

1760.

Solid Cast Steel Pump Augers

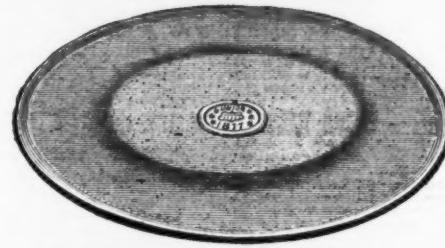
For Boring PUMPS. All sizes in stock.
Sockets, King Handles, and Connecting
Rods for the above to order. Also Tensioning Tools
for jointing log ends. Cooper's and Shapers' Tools,
Tool Chests. Tools for all trades a specialty.

1760.

Solid Cast Steel Pump Augers

For Boring PUMPS. All sizes in stock.
Sockets, King Handles, and Connecting
Rod for the above to order. Also Tensioning Tools
for jointing log ends. Cooper's and Shapers' Tools,
Tool Chests. Tools for all trades a specialty.

THE UNION STOVE BOARD.



PLAIN AND SHEET IRON LINED.

The cheapest and most durable Stove Board ever offered to the trade. Send for price list, stating quantities wanted.

F. HABERMAN, Manufacturer,

294 Pearl Street, NEW YORK.

Patent Wagon Box Rod.



Wagon Box Rods,

With wrought Nut and Washer, together with Patent Shoulder, making a perfect bearing, and also clasping the eye so it cannot be twisted out of shape. The eye is bent at a cherry red heat—therefore the iron at the base of the eye is not burnt or injured.

BROWN & CURTISS,

MANUFACTURERS OF

Patented Wrought Iron Wagon Hardware

AND

SPECIALTIES IN WROUGHT IRON,
Cleveland, Ohio.

Send for illustrated price list.

THE ULSTER SLED.



Runners and Cross Bars of one piece of metal, either Cast Steel or Iron, making the strongest as well as prettiest Sled ever made.

Its grand success of last year is a guarantee for an immense sale this year. Possessing all the qualities of a perfect sled—unique in design, beautiful in finish—makes the Ulster the favorite with children of both small and large growth. A splendid holiday present.

Manufactured by

CROSBY, GILZINGER & CO., Rondout, N. Y.

Patentees and Manufacturers of

The Sheridan Velocipede, Centennial Carriage, Sulky and Seat Springs, Centennial Seat Seats and Dexter Shifting Bars.

HOBART'S TACKS

MANUFACTURED BY

DUNBAR, HOBART & WHIDDEN,

ESTABLISHED 1810.

Office and Salesroom, 116 Chambers Street, New York. - - - Factory, South Abington, Mass.

FRENCH WIRE NAILS, ESCUTCHEON PINS,
MOULDING, PULLEY NAILS, &c.

With Round, Flat, and Fancy Heads.



Any Kind of Wire Nails made to order from Description, or Samples.

American and Swedes Iron Tacks,

Tinned, Leathered and Large Head Carpet Tacks, Finishing Nails, Black and Tinned Trunk Nails, Miners' Copper, Gimp, Lace and Brush Tacks, Hungarian, Chair, Cigar Box and Barrel Nails, Glaziers' Points,

Iron, Steel, Copper and Zinc Shoe Nails, Patent Improved Brass Shoe Nails,

Heel and Toe Plates, Steel Shanks, and Fancy Head Nails, Silver or Japanned Lining and Saddle Nails,

A full assortment always on hand at salesrooms, for immediate delivery if required. Odd and Irregular Sizes made to order or cut from sample at short notice. Send for Price List.



THE SWIFT MILL.

ESTABLISHED 1845.

The annexed cut shows one of the many styles of Coffee Mills of our manufacture, especially adapted to Grocers' use and all retailers of coffee. They are highly ornamental, and workmanship of the very best. We make more than 30 styles.

ALSO LANE'S PORTABLE COFFEE ROASTER

Will roast 30 to 40 lbs. at once, and can be used as a stove at other times. Send for descriptive list to Manufacturers.

LANE BROS., Millbrook, N. Y.

Also sold by leading wholesale houses.

Our agents, Graham & Haines, 113 Chambers St., New York, carry a full line of our goods, and will be pleased to serve you at factory prices.

The Silver & Deming FAMILY SAUSAGE STUFFER, Lard, Fruit & Jelly Press.

Powerful, Durable and Convenient.

The Best Article of the kind in the Market.

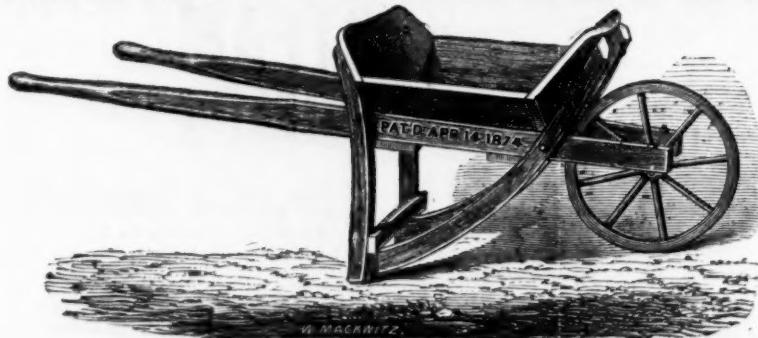
No. A, capacity 2 quarts, Japanned.....	\$2.50
B, " 4 " with inside of Cylinder Enamelled.....	4.00
AA, " 2 " with inside of Cylinder Enamelled.....	4.00
BB, " 4 " with inside of Cylinder Enamelled.....	5.50

Liberal discount to the trade.

MANUFACTURED BY
SILVER & DEMING MFG. CO.,
SALEM, OHIO.Also Manufacturers of a full line of
Butchers' Meat Choppers & Stuffers.

(Tipped back for filling.)

CHAMPION BARROWS.



WITH WOOD OR IRON WHEELS.

A first-class article and a specialty, that will make a demand in any market and afford a good margin to dealers. We are prepared to furnish them in large quantities. Manufactured by

BRYAN MANUFACTURING CO., Bryan, O.

SIMPLE & BIRGE MFG. CO., Sole Western Agents, ST. LOUIS, MO.

For Sale by THE NEW YORK PLOW CO., General Eastern Agents, 53 Beekman St., New York.

1865. THE PEERLESS CLOTHES WRINGER. 1877.

No deviation from Regular Rates.

No. 2, \$6.00.

White

Rubber Rolls,

Metal

Journal Boxes,

Patent Crank

Fastening,

Rubber

Fastening Pads,

Maple

Wood Frames.

Simple,

Durable,

Efficient.



Warranted Double the Capacity of any Purchase Gear Wringer.

Manufacturers of Clay Retorts, Fire-Bricks, Ga

House and other Tile, Cupola Brick, &c. Dealers in and Miners of Fire Clay and Fire Sand. Clay bank at Brooklyn, N. Y. Clay Works at Elizabeth, N. J. Clay Retort Works at Elizabeth, Richards and Partition Sts., Brooklyn, N. Y. Office No. 88 Van Dyke St.

ADAM WEBER, Proprietor.
Office, 633 E. 15th St., N. Y. Clay Retorts, Clay

and Retorts for Gas Works; Retorts for burning raw bone and rendering fat for Bone Charcoal, Fire Bricks, Fire Blocks, Cupola and Range Bricks of all shapes and sizes. The best fire clay from my own Clay Beds at Perth Amboy, N. J.

A. HALL & SONS, Perth Amboy, N. J.

ESTABLISHED 1866.

HALL & SONS, Buffalo, N. Y.

ESTABLISHED 1866.

FIRE BRICK

of reliable quality for all purposes, manufactured of the best New Jersey Fire Clays. Also, Architectural Terra Cotta, Fire Clay, Fire Sand, Kaolin, Ground Fire Brick and Diamantine Building Brick.

TROY FIRE BRICK WORKS,

Jas. Ostrander & Son,
Established 1848.
Manufacturers ofFIRE BRICK,
Tuyeres, Tiles, Blast Furnace Blocks, etc.Miners and Dealers in
Woodbridge Fire Clay and Sand,
and Staten Island Kaolin.Price List, Diagrams of Fire Brick,
and all other information cheerfully
furnished on application.

TROY, N. Y.

JAMES OSTRANDER,
FRANCIS A. OSTRANDER, surviving
partner.

CUMBERLAND FIRE BRICK WORKS

GARDNER, STUART & CO.,

MANUFACTURERS OF

STANDARD SAVAGE FIRE BRICK.

OFFICE: Room 3, No. 96½ Fourth Avenue, PITTSBURGH, PA.

WORKS: One Mile from Mt. Savage Junction, Md., B. & O. R. R.

Illustrated Circulars and Price Lists on application.

Harvey W. Peace, Vulcan Saw Works.

Manufacturer of every kind of

Patent Ground



SAWS.

Circulars, Cross-Cuts, Mill,
Mulay, Gang, Hand,
and Butcher.Molding and Planing Knives,
Plastering Trowels, Miter-
ing Rods, &c.

Union Avenue, Tenth and Alinslie Streets, BROOKLYN, E. D., N. Y.

E. M. BOYNTON,
Manufacturer of all kinds ofFirst-Class Saws, Saw Frames, Cross-Cut Handles, Tools, Files, &c.
Also Sole Proprietor and Mfr. of the Genuine Patent Lightning Saw,

No. 50 Beekman Street, NEW YORK.

Special attention is called to my new Centennial Saw, patented March 28th, 1876; Special File and Saw-Set combined, patented June 20th, 1876; Cross Cut (Loop) Saw, patented January 10th, 1876; New Oregon Man Saw, with Patent Double Removal Handle Attachment, March 28th, 1876; New Patent Champion Cleaver Tooth, patented August 15th, 1876; Saw Set, patented Nov. 25th, 1873—a perfect Set that a blind man can use to condense like a Hammer Set perfectly; Cross-bar Wood Saw Frame, patented Nov. 12, 1872; also Cross-Cut Handle, with castings, patented Feb. 15, 1870. These goods complete the scientific tools for cutting timber, instead of wearing it off with notched V teeth (which are like a fractured plate sharpened).

AWARDED CENTENNIAL MEDAL AFTER ACTUAL TEST.



PHILADELPHIA, November 11th, 1876.

REPORT ON AWARDS. GROUP NO. 15.

Product: Saws in great variety; special improvement in shape of teeth, called Patent Lightning Saw. Name and Address of Exhibitor: Ebeneezer Moody Boynton, New York.

The undersigned having examined the product herein described, respectfully recommends the same to the United States Centennial Commission for award, for the following reasons, viz:

Report: "Being of very Superior Quality and of great Practical Utility." DANIEL STEINMETZ, Signature of the Judge.

J. D. IMBODEN, of Virginia, CHARLES STAPLES, of Maine, G. L. REED, of Penn.

D. MCARDY, of Scotland, DAVID MCARDY, of Scotland, D. STEINMETZ, of Phila. JUDGES.

A true copy of the record. A. WALKER, of Scotland, FRANCIS A. WALKER, Chief of the Bureau of Awards.

Given by authority of the U. S. Centennial Commission. J. L. CAMPBELL, Sec'y. A. T. GOSHORN, Director General. J. R. HAWLEY, Pres.

E. C. ATKINS, ESTABLISHED 1857. H. KNIPPENBERG.

E. C. ATKINS & CO., Indianapolis, Ind., Saw Manufacturers and Repairers.

Sole manufacturers of the celebrated GENUINE SILVER STEEL DIAMOND X CUT SAW.



\$1.50 Per Foot.

CAUTION THE CLEARERS
PATENT HANDLES AND GAUGE INCLUDED.

BEWARE OF THE IMITATION CALLED "DIAMOND TOOTH."

Wheeler, Madden & Clemson

MFG. CO.,

MIDDLETOWN, - - - - - NEW YORK.

Manufacturers of

WARRANTED CAST STEEL

SAWS

Of every description, including

Circular, Shingle, Cross-Cut, Mill, Hand,

WOOD SAWS. Etc.. Etc.

AMERICAN SAW CO.,

Manufacturers of

Movable Toothed Circular Saws,

PERFORATED CROSS-CUT SAWS

And SOLID SAWS of all kinds.

Trenton, N. J.

THE BEST

Burglar Alarm

IN THE WORLD.

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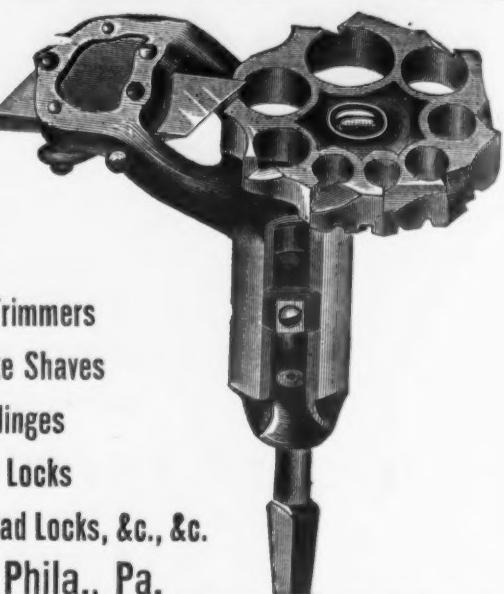
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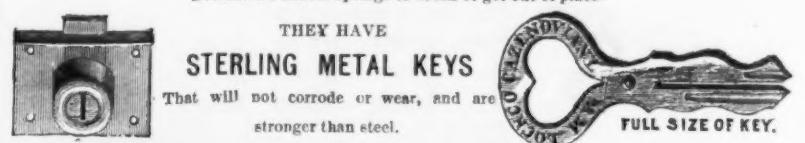
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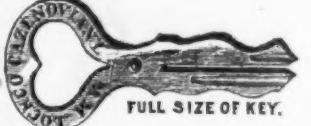
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" Loose Joint. 10 50 @ 25 & 30

Bolt. Parker. 10 50 @ 25 & 30

Buffalo Hardware Co. 10 50 @ 25 & 30

Shepard. 10 50 @ 25 & 30

Garrison. 10 50 @ 25 & 30

Chains.—German Master and Coll. 25 00 @ 25 & 30

Galvanized Pump. 10 50 @ 25 & 30

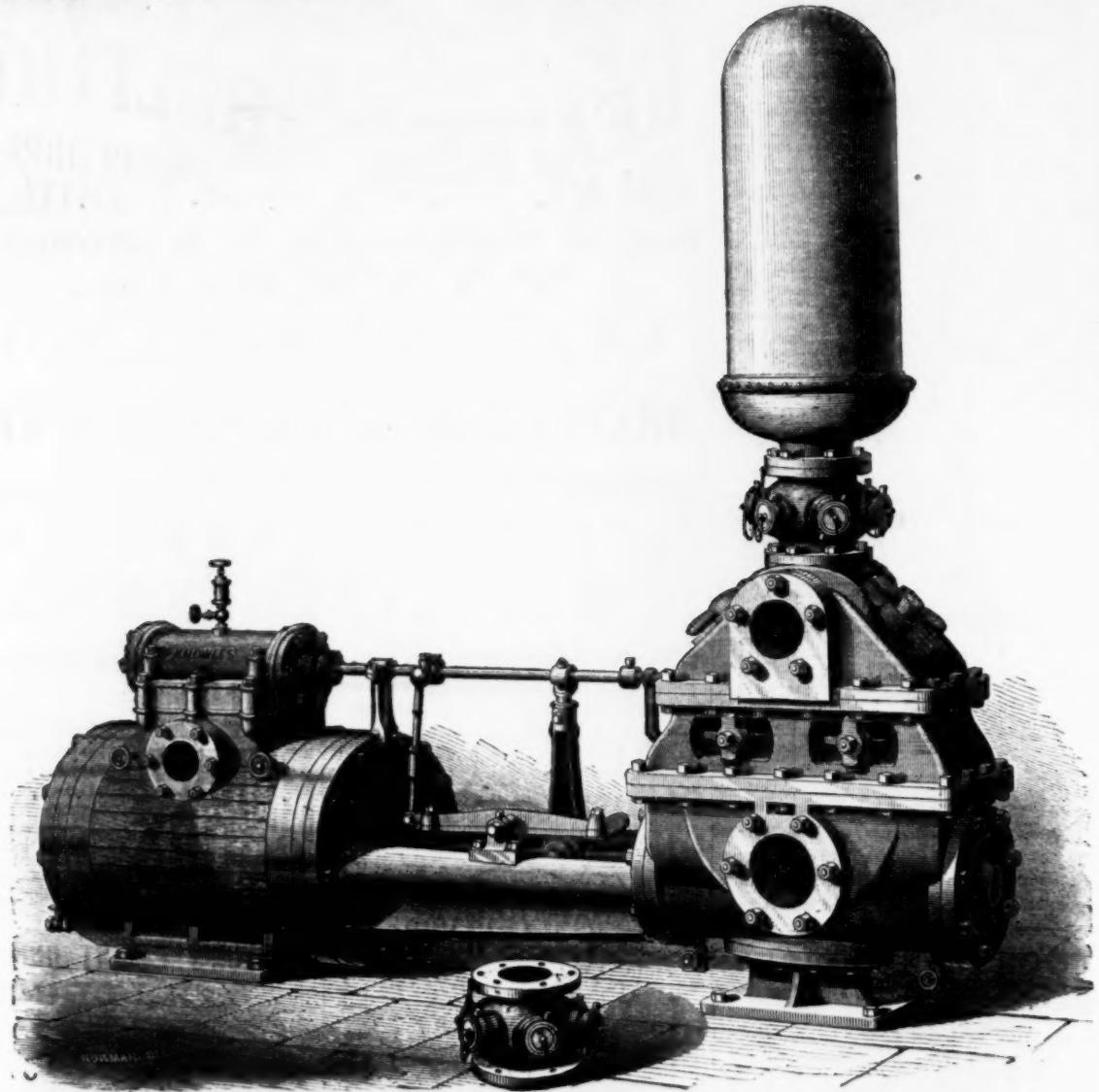
Best Proof Coil Chain. 10 50 @ 25 & 30

" 3 1/2 5 1/2 7 1/2 10 1/2 12 1/2 15 1/2 18 1/2 20 1/2 25 1/2 30 1/2 35 1/2 40 1/2 45 1/2 50 1/2 55 1/2 60 1/2 65 1/2 70 1/2 75 1/2 80 1/2 85 1/2 90 1/2 95 1/2 100 1/2 105 1/2 110 1/2 115 1/2 120 1/2 125 1/2 130 1/2 135 1/2 140 1/2 145 1/2 150 1/2 155 1/2 160 1/2 165 1/2 170 1/2 175 1/2 180 1/2 185 1/2 190 1/2 195 1/2 200 1/2 205 1/2 210 1/2 215 1/2 220 1/2 225 1/2 230 1/2 235 1/2 240 1/2 245 1/2 250 1/2 255 1/2 260 1/2 265 1/2 270 1/2 275 1/2 280 1/2 285 1/2 290 1/2 295 1/2 300 1/2 305 1/2 310 1/2 315 1/2 320 1/2 325 1/2 330 1/2 335 1/2 340 1/2 345 1/2 350 1/2 355 1/2 360 1/2 365 1/2 370 1/2 375 1/2 380 1/2 385 1/2 390 1/2 395 1/2 400 1/2 405 1/2 410 1/2 415 1/2 420 1/2 425 1/2 430 1/2 435 1/2 440 1/2 445 1/2 450 1/2 455 1/2 460 1/2 465 1/2 470 1/2 475 1/2 480 1/2 485 1/2 490 1/2 495 1/2 500 1/2 505 1/2 510 1/2 515 1/2 520 1/2 525 1/2 530 1/2 535 1/2 540 1/2 545 1/2 550 1/2 555 1/2 560 1/2 565 1/2 570 1/2 575 1/2 580 1/2 585 1/2 590 1/2 595 1/2 600 1/2 605 1/2 610 1/2 615 1/2 620 1/2 625 1/2 630 1/2 635 1/2 640 1/2 645 1/2 650 1/2 655 1/2 660 1/2 665 1/2 670 1/2 675 1/2 680 1/2 685 1/2 690 1/2 695 1/2 700 1/2 705 1/2 710 1/2 715 1/2 720 1/2 725 1/2 730 1/2 735 1/2 740 1/2 745 1/2 750 1/2 755 1/2 760 1/2 765 1/2 770 1/2 775 1/2 780 1/2 785 1/2 790 1/2 795 1/2 800 1/2 805 1/2 810 1/2 815 1/2 820 1/2 825 1/2 830 1/2 835 1/2 840 1/2 845 1/2 850 1/2 855 1/2 860 1/2 865 1/2 870 1/2 875 1/2 880 1/2 885 1/2 890 1/2 895 1/2 900 1/2 905 1/2 910 1/2 915 1/2 920 1/2 925 1/2 930 1/2 935 1/2 940 1/2 945 1/2 950 1/2 955 1/2 960 1/2 965 1/2 970 1/2 975 1/2 980 1/2 985 1/2 990 1/2 995 1/2 1000 1/2 1005 1/2 1010 1/2 1015 1/2 1020 1/2 1025 1/2 1030 1/2 1035 1/2 1040 1/2 1045 1/2 1050 1/2 1055 1/2 1060 1/2 1065 1/2 1070 1/2 1075 1/2 1080 1/2 1085 1/2 1090 1/2 1095 1/2 1100 1/2 1105 1/2 1110 1/2 1115 1/2 1120 1/2 1125 1/2 1130 1/2 1135 1/2 1140 1/2 1145 1/2 1150 1/2 1155 1/2 1160 1/2 1165 1/2 1170 1/2 1175 1/2 1180 1/2 1185 1/2 1190 1/2 1195 1/2 1200 1/2 1205 1/2 1210 1/2 1215 1/2 1220 1/2 1225 1/2 1230 1/2 1235 1/2 1240 1/2 1245 1/2 1250 1/2 1255 1/2 1260 1/2 1265 1/2 1270 1/2 1275 1/2 1280 1/2 1285 1/2 1290 1/2 1295 1/2 1300 1/2 1305 1/2 1310 1/2 1315 1/2 1320 1/2 1325 1/2 1330 1/2 1335 1/2 1340 1/2 1345 1/2 1350 1/2 1355 1/2 1360 1/2 1365 1/2 1370 1/2 1375 1/2 1380 1/2 1385 1/2 1390 1/2 1395 1/2 1400 1/2 1405 1/2 1410 1/2 1415 1/2 1420 1/2 1425 1/2 1430 1/2 1435 1/2 1440 1/2 1445 1/2 1450 1/2 1455 1/2 1460 1/2 1465 1/2 1470 1/2 1475 1/2 1480 1/2 1485 1/2 1490 1/2 1495 1/2 1500 1/2 1505 1/2 1510 1/2 1515 1/2 1520 1/2 1525 1/2 1530 1/2 1535 1/2 1540 1/2 1545 1/2 1550 1/2 1555 1/2 1560 1/2 1565 1/2 1570 1/2 1575 1/2 1580 1/2 1585 1/2 1590 1/2 1595 1/2 1600 1/2 1605 1/2 1610 1/2 1615 1/2 1620 1/2 1625 1/2 1630 1/2 1635 1/2 1640 1/2 1645 1/2 1650 1/2 1655 1/2 1660 1/2 1665 1/2 1670 1/2 1675 1/2 1680 1/2 1685 1/2 1690 1/2 1695 1/2 1700 1/2 1705 1/2 1710 1/2 1715 1/2 1720 1/2 1725 1/2 1730 1/2 1735 1/2 1740 1/2 1745 1/2 1750 1/2 1755 1/2 1760 1/2 1765 1/2 1770 1/2 1775 1/2 1780 1/2 1785 1/2 1790 1/2 1795 1/2 1800 1/2 1805 1/2 1810 1/2 1815 1/2 1820 1/2 1825 1/2 1830 1/2 1835 1/2 1840 1/2 1845 1/2 1850 1/2 1855 1/2 1860 1/2 1865 1/2 1870 1/2 1875 1/2 1880 1/2 1885 1/2 1890 1/2 1895 1/2 1900 1/2 1905 1/2 1910 1/2 1915 1/2 1920 1/2 1925 1/2 1930 1/2 1935 1/2 1940 1/2 1945 1/2 1950 1/2 1955 1/2 1960 1/2 1965 1/2 1970 1/2 1975 1/2 1980 1/2 1985 1/2 1990 1/2 1995 1/2 2000 1/2 2005 1/2 2010 1/2 2015 1/2 2020 1/2 2025 1/2 2030 1/2 2035 1/2 2040 1/2 2045 1/2 2050 1/2 2055 1/2 2060 1/2 2065 1/2 2070 1/2 2075 1/2 2080 1/2 2085 1/2 2090 1/2 2095 1/2 2100 1/2 2105 1/2 2110 1/2 2115 1/2 2120 1/2 2125 1/2 2130 1/2 2135 1/2 2140 1/2 2145 1/2 2150 1/2 2155 1/2 2160 1/2 2165 1/2 2170 1/2 2175 1/2 2180 1/2 2185 1/2 2190 1/2 2195 1/2 2200 1/2 2205 1/2 2210 1/2 2215 1/2 2220 1/2 2225 1/2 2230 1/2 2235 1/2 2240 1/2 2245 1/2 2250 1/2 2255 1/2 2260 1/2 2265 1/2 2270 1/2 2275 1/2 2280 1/2 2285 1/2 2290 1/2 2295 1/2 2300 1/2 2305 1/2 2310 1/2 2315 1/2 2320 1/2 2325 1/2 2330 1/2 2335 1/2 2340 1/2 2345 1/2 2350 1/2 2355 1/2 2360 1/2 2365 1/2 2370 1/2 2375 1/2 2380 1/2 2385 1/2 2390 1/2 2395 1/2 2400 1/2 2405 1/2 2410 1/2 2415 1/2 2420 1/2 2425 1/2 2430 1/2 2435 1

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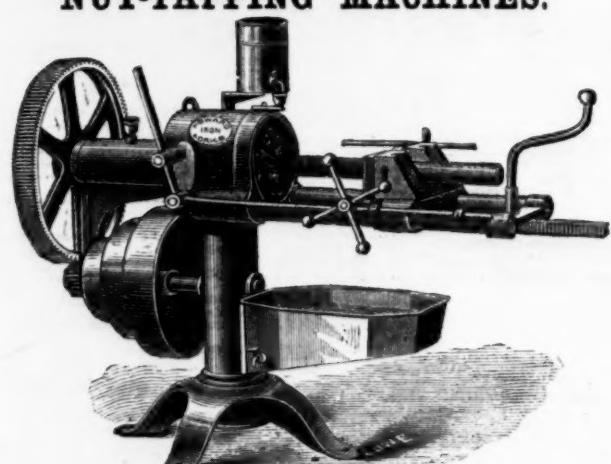
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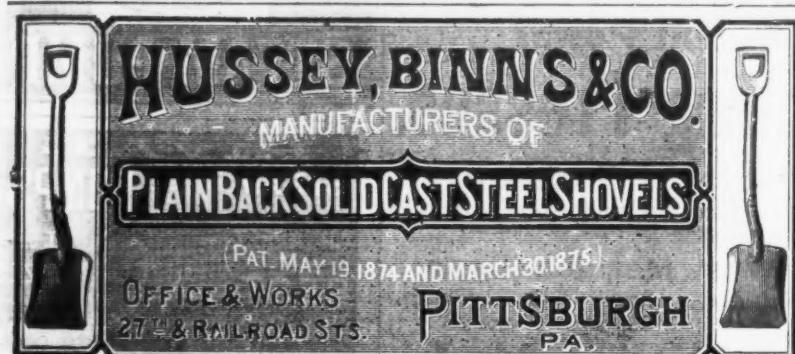


W. A. CLARK'S PATENT.

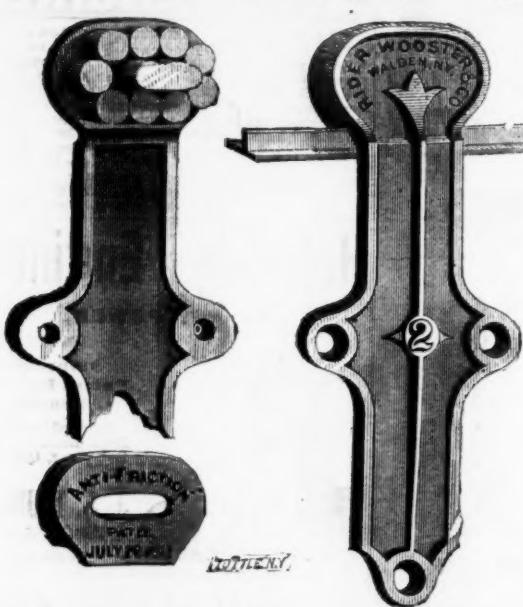
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This well-known and popular Hanger is in too general use to require any description.

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Guaranteed to run twice as easily as any other style.

It is the ONLY ONE made without a Sheave or Wheel, and that will not mount the rail or run off the track.

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Patented 1870, 1872 and 1874; Improved 1875 and 1877. ARTHUR TOWNE, Patentee. Bronzing all goods, whether of metal, plaster or wood, viz.: Picture frames, ornaments, steam and gas fixtures—in fact, any good and wares which is liable to be applied by anyone. For strength it has no equal. For ornamental purposes it is unsurpassed. It is used in the construction of the New York Custom House in Boston and New York. Custom House were decorated with this liquid. For yacht and vessel bottoms it has no equal, having been used by the Boston Yacht Club the past four years, besides many others too numerous to mention.

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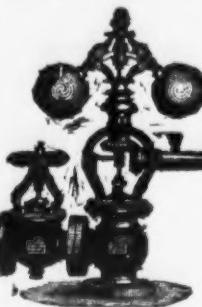
Axle Handles—Wadleigh's Oak-A (Extra), \$250. B (No. 1) \$200. C (No. 2) \$150. D (No. 3) \$100.	per lb. 9c
Blind Fenders—Off or Washburn's. per hun dets \$8.	
Boats—Carriage, Phila.	dis 60¢ to 25¢
Clothes, Cotton,	dis 10¢ to 5¢
Borax—Household,	per lb. 15¢
Borax—Angle, Backus',	dis 30¢ to 15¢
Boring Machines—Angle, ...	each \$1.50
Bracelets—Garrison's,	each \$1.50
Buckles—Backus',	new list \$10 to 5¢
Spoofford's,	
Brackets—	
Saw frames, with patterns complete,	per doz \$6 to 10¢
Saws—	
Star Framed, Centennial,	new list \$3 to 10¢
Star Bronzed,	new list net
Star Steel,	new list net
Store Shelf,	per doz \$10 to 5¢
Brass Faucets—L. F. & C.,	dis 10¢ to 5¢
Brushes—Horse, Patent Metalic,	per doz \$4 to \$10
Butts—Union Standard,	Wire Fast Joint, " Acorn Loose Jt., "
Butts—	dis 10¢ to 5¢
Brass Buttons,	dis 10¢ to 5¢
Cards—	
Card, Cards, No. X, per doz, \$10.35. Horse, " No. X, " " 10.35. Wool, " No. 3X, " " 25.00. Cotton, " No. 10, " " 30.00.	dis 30¢ to 15¢
Carried—A. C. Carrington's,	dis 20¢ to 10¢
Chisels—Buck Bros.' Shank & Groover,	dis 25¢ to 15¢
Compasses and Dividers—Beavis', P. S. & C.,	dis 10¢ to 5¢
Cooperage—Musical Trade,	per doz \$14 to 10¢
Cook Books,	per doz \$2.75
Crow Bars—Solid Steel,	per lb. 9c
Dividers—Cook's Nickel Plated,	dis 15¢ to 10¢
Door Springs—Moseley—Per doz, 0.00. 0.00. 1.00. 2.00. 3.00. 4.00. 5.00. 6.00. 7.00. 8.00. 9.00. 10.00. 11.00. 12.00. 13.00. 14.00. 15.00. 16.00. 17.00. 18.00. 19.00. 20.00. 21.00. 22.00. 23.00. 24.00. 25.00. 26.00. 27.00. 28.00. 29.00. 30.00. 31.00. 32.00. 33.00. 34.00. 35.00. 36.00. 37.00. 38.00. 39.00. 40.00. 41.00. 42.00. 43.00. 44.00. 45.00. 46.00. 47.00. 48.00. 49.00. 50.00. 51.00. 52.00. 53.00. 54.00. 55.00. 56.00. 57.00. 58.00. 59.00. 60.00. 61.00. 62.00. 63.00. 64.00. 65.00. 66.00. 67.00. 68.00. 69.00. 70.00. 71.00. 72.00. 73.00. 74.00. 75.00. 76.00. 77.00. 78.00. 79.00. 80.00. 81.00. 82.00. 83.00. 84.00. 85.00. 86.00. 87.00. 88.00. 89.00. 90.00. 91.00. 92.00. 93.00. 94.00. 95.00. 96.00. 97.00. 98.00. 99.00. 100.00. 101.00. 102.00. 103.00. 104.00. 105.00. 106.00. 107.00. 108.00. 109.00. 110.00. 111.00. 112.00. 113.00. 114.00. 115.00. 116.00. 117.00. 118.00. 119.00. 120.00. 121.00. 122.00. 123.00. 124.00. 125.00. 126.00. 127.00. 128.00. 129.00. 130.00. 131.00. 132.00. 133.00. 134.00. 135.00. 136.00. 137.00. 138.00. 139.00. 140.00. 141.00. 142.00. 143.00. 144.00. 145.00. 146.00. 147.00. 148.00. 149.00. 150.00. 151.00. 152.00. 153.00. 154.00. 155.00. 156.00. 157.00. 158.00. 159.00. 160.00. 161.00. 162.00. 163.00. 164.00. 165.00. 166.00. 167.00. 168.00. 169.00. 170.00. 171.00. 172.00. 173.00. 174.00. 175.00. 176.00. 177.00. 178.00. 179.00. 180.00. 181.00. 182.00. 183.00. 184.00. 185.00. 186.00. 187.00. 188.00. 189.00. 190.00. 191.00. 192.00. 193.00. 194.00. 195.00. 196.00. 197.00. 198.00. 199.00. 200.00. 201.00. 202.00. 203.00. 204.00. 205.00. 206.00. 207.00. 208.00. 209.00. 210.00. 211.00. 212.00. 213.00. 214.00. 215.00. 216.00. 217.00. 218.00. 219.00. 220.00. 221.00. 222.00. 223.00. 224.00. 225.00. 226.00. 227.00. 228.00. 229.00. 230.00. 231.00. 232.00. 233.00. 234.00. 235.00. 236.00. 237.00. 238.00. 239.00. 240.00. 241.00. 242.00. 243.00. 244.00. 245.00. 246.00. 247.00. 248.00. 249.00. 250.00. 251.00. 252.00. 253.00. 254.00. 255.00. 256.00. 257.00. 258.00. 259.00. 260.00. 261.00. 262.00. 263.00. 264.00. 265.00. 266.00. 267.00. 268.00. 269.00. 270.00. 271.00. 272.00. 273.00. 274.00. 275.00. 276.00. 277.00. 278.00. 279.00. 280.00. 281.00. 282.00. 283.00. 284.00. 285.00. 286.00. 287.00. 288.00. 289.00. 290.00. 291.00. 292.00. 293.00. 294.00. 295.00. 296.00. 297.00. 298.00. 299.00. 300.00. 301.00. 302.00. 303.00. 304.00. 305.00. 306.00. 307.00. 308.00. 309.00. 310.00. 311.00. 312.00. 313.00. 314.00. 315.00. 316.00. 317.00. 318.00. 319.00. 320.00. 321.00. 322.00. 323.00. 324.00. 325.00. 326.00. 327.00. 328.00. 329.00. 330.00. 331.00. 332.00. 333.00. 334.00. 335.00. 336.00. 337.00. 338.00. 339.00. 340.00. 341.00. 342.00. 343.00. 344.00. 345.00. 346.00. 347.00. 348.00. 349.00. 350.00. 351.00. 352.00. 353.00. 354.00. 355.00. 356.00. 357.00. 358.00. 359.00. 360.00. 361.00. 362.00. 363.00. 364.00. 365.00. 366.00. 367.00. 368.00. 369.00. 370.00. 371.00. 372.00. 373.00. 374.00. 375.00. 376.00. 377.00. 378.00. 379.00. 380.00. 381.00. 382.00. 383.00. 384.00. 385.00. 386.00. 387.00. 388.00. 389.00. 390.00. 391.00. 392.00. 393.00. 394.00. 395.00. 396.00. 397.00. 398.00. 399.00. 400.00. 401.00. 402.00. 403.00. 404.00. 405.00. 406.00. 407.00. 408.00. 409.00. 410.00. 411.00. 412.00. 413.00. 414.00. 415.00. 416.00. 417.00. 418.00. 419.00. 420.00. 421.00. 422.00. 423.00. 424.00. 425.00. 426.00. 427.00. 428.00. 429.00. 430.00. 431.00. 432.00. 433.00. 434.00. 435.00. 436.00. 437.00. 438.00. 439.00. 440.00. 441.00. 442.00. 443.00. 444.00. 445.00. 446.00. 447.00. 448.00. 449.00. 450.00. 451.00. 452.00. 453.00. 454.00. 455.00. 456.00. 457.00. 458.00. 459.00. 460.00. 461.00. 462.00. 463.00. 464.00. 465.00. 466.00. 467.00. 468.00. 469.00. 470.00. 471.00. 472.00. 473.00. 474.00. 475.00. 476.00. 477.00. 478.00. 479.00. 480.00. 481.00. 482.00. 483.00. 484.00. 485.00. 486.00. 487.00. 488.00. 489.00. 490.00. 491.00. 492.00. 493.00. 494.00. 495.00. 496.00. 497.00. 498.00. 499.00. 500.00. 501.00. 502.00. 503.00. 504.00. 505.00. 506.00. 507.00. 508.00. 509.00. 510.00. 511.00. 512.00. 513.00. 514.00. 515.00. 516.00. 517.00. 518.00. 519.00. 520.00. 521.00. 522.00. 523.00. 524.00. 525.00. 526.00. 527.00. 528.00. 529.00. 530.00. 531.00. 532.00. 533.00. 534.00. 535.00. 536.00. 53	

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It is a common method to advertise Governors without cost, unless satisfactory to the customer, and then charge *High Prices* for doing what any good Governor will do. Various Governors inferior to the "Judson" are sold for less, operating well enough for three months, then losing collection of the pay, but becoming useless after a year's wear—their construction lacking durability. The Judson Governor is guaranteed to be not only the best Regulator of Steam Engines, but also the most durable Governor made. Parties in buying a Governor should stipulate that their durability be guaranteed, and should also take care that they do not make inferior Governors, pay higher prices than those shown in the accompanying list. We guarantee the Judson Governor will do all any other Governor can do, and in Accuracy and Durability—the main essentials—we guarantee it shall do more.

Reduced Price List, FEBRUARY 1, 1877.

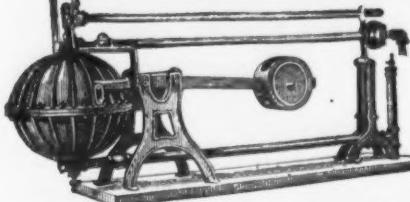
For dimensions of Governor, see Illustrated Price List.



THE JUDSON PATENT
Improved Steam Governor.

No Charge for Boxes & Cartage.
JUNIUS JUDSON & SON, Rochester, N. Y.

The Albany Steam Trap.

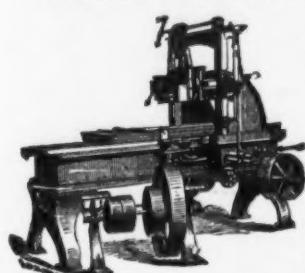


This Trap automatically drains the water of condensation from *Heating Coils*, and returns the same to the Boiler whether the Coils are above or below the water level in Boiler, thus doing away with pumps and other mechanical devices for such purposes. Apply to

Albany Steam Trap Company,
Albany, N. Y.

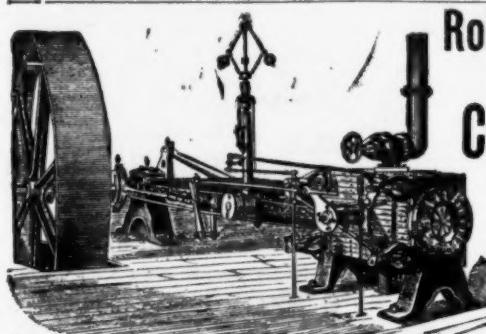
The Pratt & Whitney Co., Hartford, Conn.,

Have constantly on hand and making



Drop Hammers

Of recently Improved Construction. Pony Trip Hammers, Blacksmiths' Sheaves, Broaching and Stamping Presses, Iron Shop Cranes, Machinists' Tools, Gun and Sewing Machine Machinery. Make to order Gray and Charcoal Iron Castings of all styles and sizes not exceeding 15 tons weight, (making patterns if desired). Furnish Clamp Pulleys of light patterns, cut gears in a superior manner, &c., &c.



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PORTABLE DRILLS. Driven by power in any direction.
RAILROAD DRILLS. Self-feed—Large Adjustable Box Table.
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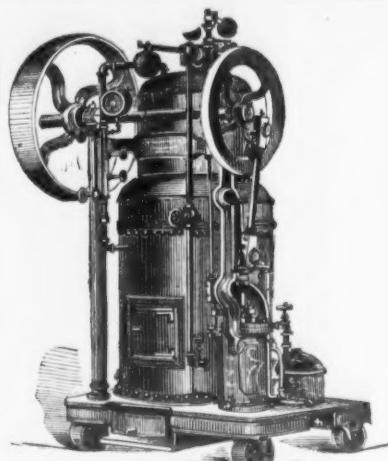
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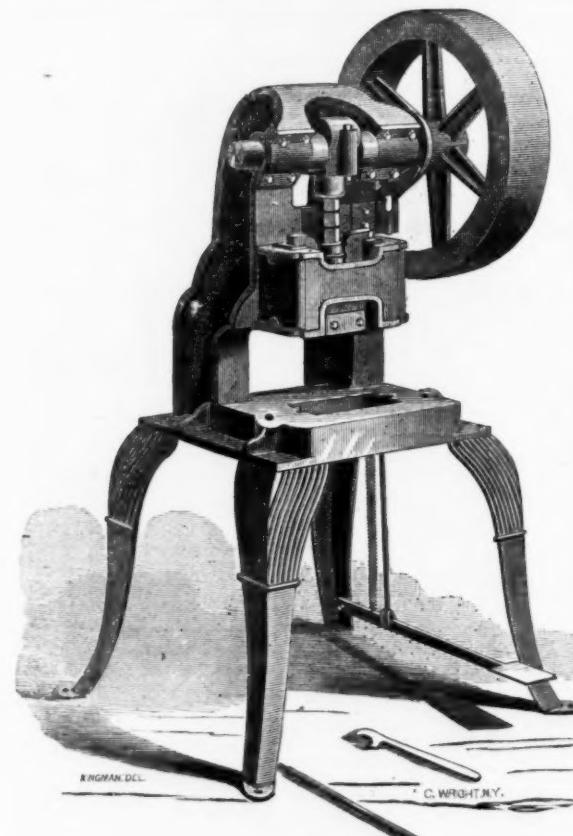
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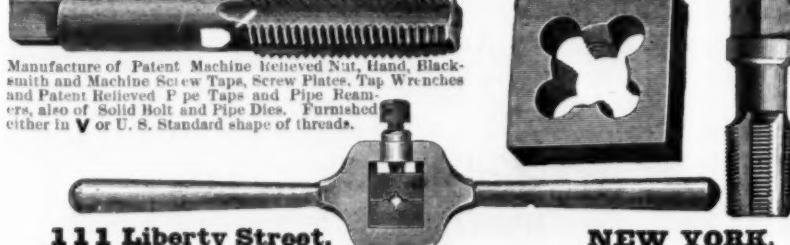
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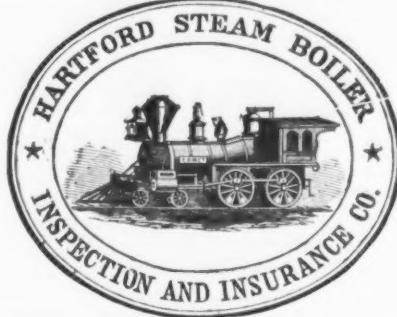
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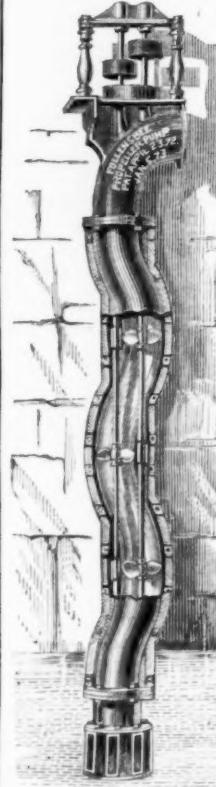
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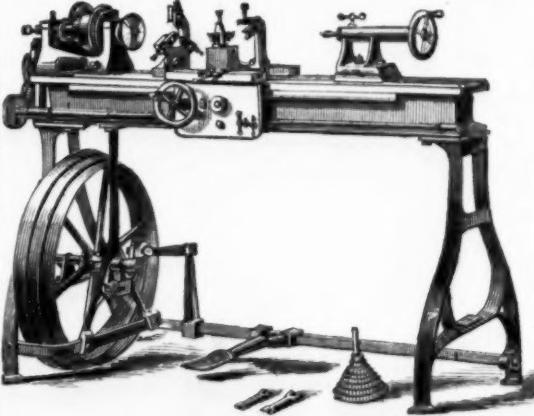
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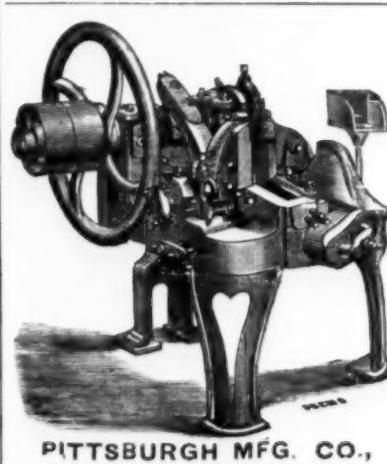
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